

# **NAVAL POSTGRADUATE SCHOOL**

## **Monterey, California**



## **THESIS**

**STUDY OF PERFORMANCE-BASED PAYMENTS (PBP)  
AND DEPARTMENT OF DEFENSE (DoD) CONTRACTS**

by

John M. Pearson

June 1999

Thesis Co-Advisors:

Joseph G. San Miguel  
David A. Smith

**Approved for public release; distribution is unlimited.**

# REPORT DOCUMENTATION PAGE

*Form Approved  
OMB No. 0704-0188*

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED	
	June 1999	Master's Thesis	
4. TITLE AND SUBTITLE <b>STUDY OF PERFORMANCE-BASED PAYMENTS (PBP) AND DEPARTMENT OF DEFENSE (DoD) CONTRACTS</b>		5. FUNDING NUMBERS	
6. AUTHOR Pearson, John M.		5. FUNDING NUMBERS	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			
8. PERFORMING ORGANIZATION REPORT NUMBER		10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)			
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.		12b. DISTRIBUTION CODE	
13. ABSTRACT (maximum 200 words) The purpose of this thesis is to examine how three major defense acquisition programs (MDAPs) [C-17, Family of Medium Tactical Vehicles (FMTV), E-2C] have used performance-based payments (PBP) and to determine what the important issues are, and how this method of contract financing might be enhanced in Department of Defense (DoD) contracts. Each of the MDAPs was reviewed to provide background about the acquisition program, and their use of PBP. A series of analyses was conducted to assess the impact of using PBP versus progress payments based on costs on a contractor's cash flow. Fourteen telephone interviews were conducted with DoD and defense contractors involved with PBP. Analysis led to concluding: regulation limits the use of PBP, PBP education and training is insufficient, the PBP payment process needs to be improved, PBP appear to facilitate timely deliveries, PBP are not suited for all procurements, and there are cases when PBP are advantageous. Recommendations to enhance PBP are: developing additional training/education and materials/programs, improving the payment end of PBP, incorporating "annual reevaluation" clauses in multi-year contracts, and considering whether PBP are appropriate.			
14. SUBJECT TERMS Performance-Based Payments, Contract Financing, C-17, FMTV, E-2C		15. NUMBER OF PAGES 148	
		16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)  
Prescribed by ANSI Std. Z39-18



**Approved for public release; distribution is unlimited**

**STUDY OF PERFORMANCE-BASED PAYMENTS (PBP) AND DEPARTMENT  
OF DEFENSE (DoD) CONTRACTS**

John M. Pearson  
Lieutenant Commander, Supply Corps, United States Navy  
M.B.A., Hawaii Pacific University, 1997  
B.B.A., Baylor University, 1984

Submitted in partial fulfillment of the  
requirements for the degree of

**MASTER OF SCIENCE IN MANAGEMENT**

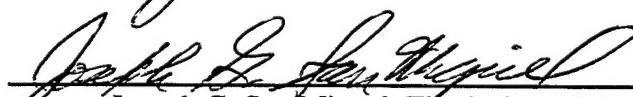
from the

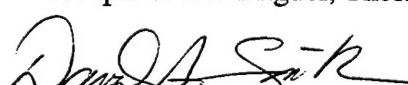
**NAVAL POSTGRADUATE SCHOOL**  
**June 1999**

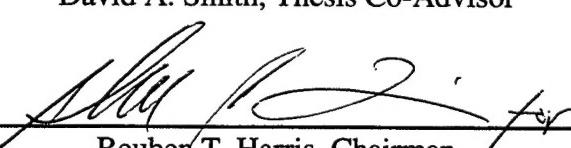
Author:

  
John M. Pearson

Approved by:

  
Joseph G. San Miguel, Thesis Co-Advisor

  
David A. Smith, Thesis Co-Advisor

  
Reuben T. Harris, Chairman  
Department of Systems Management



## **ABSTRACT**

The purpose of this thesis is to examine how three major defense acquisition programs (MDAPs) [C-17, Family of Medium Tactical Vehicles (FMTV), E-2C] have used performance-based payments (PBP) and to determine what the important issues are, and how this method of contract financing might be enhanced in Department of Defense (DoD) contracts. Each of the MDAPs was reviewed to provide background about the acquisition program, and their use of PBP. A series of analyses was conducted to assess the impact of using PBP versus progress payments based on costs on a contractor's cash flow. Fourteen telephone interviews were conducted with DoD and defense contractors involved with PBP. Analysis led to concluding: regulation limits the use of PBP, PBP education and training is insufficient, the PBP payment process needs to be improved, PBP appear to facilitate timely deliveries, PBP are not suited for all procurements, and there are cases when PBP are advantageous. Recommendations to enhance PBP are: developing additional training/education and materials/programs, improving the payment end of PBP, incorporating "annual reevaluation" clauses in multi-year contracts, and considering whether PBP are appropriate.



## TABLE OF CONTENTS

<b>I. INTRODUCTION.....</b>	<b>1</b>
A. PURPOSE .....	1
B. BACKGROUND.....	2
C. RESEARCH OBJECTIVE .....	2
D. RESEARCH QUESTIONS.....	2
E. SCOPE OF RESEARCH .....	3
F. RESEARCH METHODOLOGY.....	4
G. ORGANIZATION OF STUDY .....	4
<b>II. BACKGROUND .....</b>	<b>7</b>
A. THE BEGINNINGS OF PERFORMANCE-BASED PAYMENTS .....	7
B. CONTRACT FINANCING.....	8
1. Private Financing .....	9
2. Customary Contract Financing .....	9
3. Loan Guarantees .....	12
4. Unusual Progress Payments .....	12
5. Advance Payments.....	12
C. PERFORMANCE-BASED PAYMENT POLICY .....	13
1. Federal Acquisition Streamlining Act of 1994.....	13
2. FAR Subpart 32.10 "Performance-Based Payments" .....	15
D. ADVANTAGES OF PBP .....	19
E. DISADVANTAGES OF PBP .....	21
F. NOTIONAL CONTRACT - USING PBP AND PROGRESS PAYMENTS.....	24
G. ADMINISTRATION OF PBP.....	26
H. PROPOSED CHANGES TO PBP .....	29
I. SUMMARY.....	30
<b>III. PROGRAMS .....</b>	<b>33</b>
A. C-17 TRANSPORT PROGRAM.....	33
1. Program Overview .....	33
2. Contract Specifics .....	35
3. Performance-Based Payments.....	36
B. E-2C "HAWKEYE" AIRCRAFT PROGRAM .....	40
1. Program Overview .....	40
2. Contract Specifics .....	40
3. Performance-Based Payments.....	41
C. FAMILY OF MEDIUM TACTICAL VEHICLES (FMTV) PROGRAM .....	44
1. Program Overview .....	44
2. Contract Specifics .....	46
3. Performance-Based Payments.....	46
D. SUMMARY.....	49
<b>IV. ANALYSIS OF THE DATA.....</b>	<b>51</b>
A. INTRODUCTION.....	51
B. SIMILARITIES AND DISIMILARITIES OF CONTRACTS .....	51
C. CASH FLOW ANALYSIS.....	54
1. Methodology Used.....	55

2.	Scenario One - Everything Goes As Planned.....	56
3.	Scenario Two – Costs Decrease Three Percent .....	57
4.	Scenario Three – Costs Increase Three Percent.....	60
5.	Scenario Four – The First Event Occurs Late.....	61
6.	Scenario Five – What Actually Occurred .....	63
7.	Summary.....	64
D.	INTERVIEWS.....	66
1.	Question One .....	67
2.	Question Two.....	69
3.	Question Three .....	72
4.	Question Four .....	77
5.	Question Five.....	81
E.	SUMMARY .....	83
<b>V. CONCLUSIONS, RECOMMENDATIONS, AND AREAS FOR ADDITIONAL RESEARCH</b>		<b>85</b>
A.	GENERAL .....	85
B.	CONCLUSIONS.....	87
1.	Regulation Limits the Use of PBP .....	88
2.	PBP Education and Training is Insufficient.....	88
3.	The Payment End of PBP Needs to be Improved.....	89
4.	PBP Appear to Facilitate Timely Deliveries.....	89
5.	PBP are not Suited for All Fixed-Price, Sole Source Noncommercial Procurements.....	90
6.	When there is a Mature Production Line and a Contractor has Confidence in his Systems and Processes, then PBP are Definitely More Advantageous Financially than Progress Payments.....	90
C.	RECOMMENDATIONS.....	91
1.	Additional Education and Training Materials Need to be Developed.....	91
2.	Multiyear Procurements Using PBP Should Contain an “Annual Reevaluation” Clause Similar to that Used in the C-17 Contract .....	92
3.	PCOs Should Consider Requesting Cost Reporting Information for Contracts that Use PBP... .....	93
4.	Improve the PBP Disbursement and Accounting Process.....	93
5.	When Practical and Feasible, Defense Contractors Should Push for PBP Versus Progress Payments.....	94
6.	Contractors and Buying Commands Considering PBP Should First Look Closely at the Maturity of the Product, Stability of Design, the Length and Steps in the Production Cycle, and the Contractor’s Systems.....	95
D.	SUMMARY OF RESEARCH QUESTIONS .....	96
1.	Primary Research Question. What are the Significant Issues Associated with the PBP Method of Contractor Financing and How Might this Method be Enhanced to Improve its Use? .....	96
2.	Secondary Research Question #1. What are PBP? .....	97
3.	Secondary Research Question #2. How are PBP Currently being Utilized?.....	98
4.	Secondary Research Question #3. What are the Critical Issues and Problems Associated with PBP? .....	98
5.	Secondary Research Question #4. How does Private Industry and the DoD View PBP?.....	98
6.	Secondary Research Question #5. What is the Nature of the PBP Evaluation Process?.....	99
7.	Secondary Research Question #6. How does the Government Monitor PBP? .....	99
8.	Secondary Research Question #7. What will a Financial Analysis of Actual PBP Suggest when Compared to Progress Payments Based on Costs?.....	100
9.	Secondary Research Question #8. How Might the PBP Process be Improved and Utilized in Other Contracts?.....	100
E.	AREAS FOR ADDITIONAL RESEARCH.....	101

1. Research the Level of Accuracy of Contracts' PBP Schedule Costs. Analyze the Cash Flows of the Contracts and Compare this to Actual Costs (Would Need Cost Reporting Information from the Contractor) .....	101
2. Research and Analyze the Delivery Profiles of Contracts Using PBP. Determine Whether PBP are Motivating Contractors to Keep Up with the Production Schedules Better than Progress Payments Would Have. ....	101
3. Determine Methods Not Analyzed in this Thesis to Promote More PBP Participation by Buying Commands and Defense Contractors.....	101
4. Quantify the Additional Costs of Using PBP Versus Progress Payments Based on Costs.....	101
<b>APPENDIX A: PBP SURVEILLANCE PLAN.....</b>	<b>103</b>
<b>APPENDIX B: MALCOLM BALDRIDGE NATIONAL QUALITY AWARD 1998 WINNER ....</b>	<b>119</b>
<b>APPENDIX C: E-2C FY 98 PBP SCHEDULE .....</b>	<b>125</b>
<b>APPENDIX D: E-2C FY 98 PRICE, PAYMENT, AND COST SCHEDULE.....</b>	<b>127</b>
<b>APPENDIX E: LIST OF TELEPHONE INTERVIEWEES.....</b>	<b>129</b>
<b>LIST OF REFERENCES .....</b>	<b>131</b>
<b>INITIAL DISTRIBUTION LIST .....</b>	<b>135</b>

x

## LIST OF FIGURES

FIGURE 2.1.	PBP VOLUME USAGE .....	15
FIGURE 2.2.	ADVANTAGES OF PBP .....	20
FIGURE 2.3.	DISADVANTAGES OF PBP .....	22
FIGURE 2.4.	PBP, PRESENT VALUE OF CASH FLOW ANALYSIS ....	26
FIGURE 2.5.	PBP ADMINISTRATION .....	27
FIGURE 3.1.	C-17 MULTIYEAR PRODUCTION SCHEDULE .....	34
FIGURE 3.2.	AIRCRAFT EVENT CRITERIA .....	37
FIGURE 3.3.	SUCCESS CRITERIA AND VERIFICATION .....	38
FIGURE 3.4.	E-2C MULTIYEAR PRODUCTION SCHEDULE .....	41
FIGURE 3.5.	FMTV SCHEDULE .....	46
FIGURE 3.6.	VEHICLE EVENT CRITERIA .....	47
FIGURE 4.1.	SCENARIO ONE .....	57
FIGURE 4.2.	SCENARIO TWO .....	58
FIGURE 4.3.	SCENARIO THREE .....	60
FIGURE 4.4.	SCENARIO FOUR .....	62
FIGURE 4.5.	SCENARIO FIVE .....	63
FIGURE 4.6.	SUMMARY OF SCENARIOS .....	65

## I. INTRODUCTION

### A. PURPOSE

The purpose of this thesis is to investigate a relatively new and a preferred method of contract financing for noncommercial items called performance-based payments (PBP). Specifically, the focus of the thesis is to understand what the significant issues associated with PBP are, as well as, determine how this method of financing might be enhanced.

PBP are unlike the more common form of contract financing for noncommercial items, called progress payments, which regularly reimburse contractors for a specified percentage of the costs they incur. Instead, PBP are made only when a pre-determined, measurable event occurs that is specified in a contract. Intuitively it appears logical that paying for performance as opposed to paying for costs gives the Department of Defense (DoD) more control over its ability to control risk and incentivize performance. However, as the Director of the Acquisition Center for the Army's Communication Electronics Command (CECOM) stated:

You need to recognize that for industry to want to buy into it [PBP] they are going to have to see a better cash flow or some other improvement in their return on investment over the current process... (Elgart).

**B. BACKGROUND**

Pursuant to the Federal Acquisition and Streamlining Act of 1994 (FASA), item I of the Federal Acquisition Circular (FAC) number 90-33 amended the Federal Acquisition Regulation (FAR) pertaining to Contract Financing. One of the specific things that this change did was authorize contract financing through PBP. The effective date of this FAR change was October 1, 1995 ("Contract Financing").

**C. RESEARCH OBJECTIVE**

The objective of this thesis is to examine how three separate major defense acquisition programs (MDAPs) have used PBP and to determine what the important issues related to PBP are, and how this method of contract financing might be enhanced in DoD contracts. Documenting this allows others to utilize this research as a tool and helps them determine whether or not this form of contract financing may be applicable to their specific acquisitions.

**D. RESEARCH QUESTIONS**

The primary research question is: What are the significant issues associated with the PBP method of contract financing and how might this method be enhanced to improve its use?

The following subsidiary questions were developed to assist in answering the primary research question:

1. What are PBP?
2. How are PBP currently being utilized?
3. What are the critical issues and problems associated with PBP?
4. How does private industry and the DoD view PBP?
5. What is the nature of the PBP evaluation process?
6. How does the Government monitor PBP?
7. What will a financial analysis of actual PBP suggest when compared to progress payments based on costs?
8. How might the PBP process be improved and utilized in other contracts?

**E. SCOPE OF RESEARCH**

This thesis develops an understanding of PBP. The study focuses on the current utilization of PBP within the DoD; specifically, on three MDAPs. These include the C-17 (Air Force), the Family of Medium Tactical Vehicles (FMTV - Army) and the E-2C (Navy). This thesis provides recommendations for enhancing this method of contract financing as well as suggestions for its application.

Furthermore, it is assumed that the reader has a basic understanding of acquisition concepts, terminology, as well as the basics of major weapon systems acquisition. Any references to he, his, himself, etc., in this thesis is intended to be gender neutral unless referring to a specific individual.

#### **F. RESEARCH METHODOLOGY**

The research methodology involves a comprehensive review of available literature that was collected by means of an extensive literature search, a review of the applicable sections of the three MDAP contracts, a cash flow analysis of a PBP schedule, and 14 interviews with acquisition professionals and commercial industry representatives. The literature research includes a review of: (1) professional journals and periodicals, (2) Government audit reports, (3) United States DoD publications, (4) internet resources from Government and private sources, and a (5) CD-ROM system.

The review of the MDAPs looks at the programs' histories, contract specifics, and information regarding the use of PBP in the contracts. The cash flow analysis uses an actual PBP schedule from one of the MDAP's contracts as a base line to conduct a series of "what if" financial analyses. This enables an assessment to be made comparing progress payments to PBP over a given number of scenarios. The interviews are informal and structured around the questions stated in Chapter IV.

#### **G. ORGANIZATION OF STUDY**

The next chapter provides background information and a historical perspective of PBP.

Chapter III reviews how three separate MDAP contracts from each of the military services have utilized PBP. An overview of each program as well as a history of each is included.

Chapter IV presents a descriptive analysis of the similarities and differences between the three contracts. Secondly, a series of cash flow analyses is conducted using the PBP schedule from one of the contracts. This chapter also contains a synopsis of the responses of the acquisition professionals and industry representatives' interviews.

The final chapter addresses conclusions, recommendations, and suggests areas for additional research in PBP.



## **II. BACKGROUND**

The purpose of this chapter is to provide background information on the performance-based payment (PBP) method of contractor financing in the Department of Defense (DoD). This chapter will first discuss the origin and central themes of PBP, then provide an overview of contract financing alternatives. A summary of the most current regulations that govern the use of PBP in the DoD will follow these sections. Next, the advantages and disadvantages of PBP will be presented with a notional comparison of a contract using progress payments and PBP. The chapter will conclude with sections on Defense Contract Management Command's (DCMC) role in the PBP process and proposed Federal Acquisition Regulation (FAR) changes on contractor financing.

### **A. THE BEGINNINGS OF PERFORMANCE-BASED PAYMENTS**

In 1983, a study called the Defense Finance and Investment Review (DFAIR) was chartered to "review the interrelationship of pricing, financing, and markup policies and to make recommendations to provide for integration of policies" (i). One of the recommendations of the DFAIR was very similar to what is now known as PBP. The DFAIR recommended that "milestone or interim acceptance payments should be permitted on large dollar contracts where there

are more than three years from contract start to first delivery" (E-3).

Further, the DFAIR recommends that these milestones or interim acceptances should be "based on clearly identifiable events whose completion can be verified and whose costs can be reasonably estimated," and that payments should occur not more frequently than monthly (E-3 - E-4).

The DFAIR noted that the Navy traditionally pays its shipbuilders' progress payments which are based on contract price and the physical progress of the ship's construction (VIII-1). This study noted that this form of financing is:

...fundamentally different from usual DoD progress payments, which are based on cost, not physical progress, and which require significant contractor investment in inventory (DFAIR VIII-1).

Before discussing PBP, it is advantageous to have some familiarity with contract financing in general.

#### **B. CONTRACT FINANCING**

In order to facilitate contract performance, the Government provides several financing methods. To minimize its risk in the event a contractor requests financing, the Government Contracting Officer should consider financing methods in the following preference in accordance with Federal Acquisition Regulation (FAR) 32.106 [order of preference for non-commercial item purchase financing]: (a) private financing, (b) "customary" contract financing, (c)

loan guarantees, (d) "unusual" progress payments, and (e) advance payments.

The aforementioned priority of contractor financing was established to minimize the Government's financial exposure or risk. Thus, for non-commercial items the contractor financing spectrum runs the gamut from zero risk or financial exposure on one end (private financing), to an ever increasing amount of risk on the other end (advance payments).

### **1. Private Financing**

A contractor using a line of credit with a bank to finance working capital is an example of private financing. This method is preferred because the Government maintains a complete "hands-off" approach. Thus, the responsibility and the liability associated with obtaining financing rests solely with the contractor and the lender.

However, there are instances where a procuring contracting officer (PCO) may find it advantageous for the Government to help a contractor with financing. In such circumstances the PCO will look first at customary contract financing arrangements.

### **2. Customary Contract Financing**

FAR 32.113 lists a myriad of customary contract financing arrangements. They are dependent on the nature of the product or service being procured and the competitive

environment. Customary contract financing includes: (1) financing of ship building, or repair, when percentage or stage of completion can be utilized, (2) financing of construction or architect-engineer services, (3) financing for contracts awarded under the sealed bid method through progress payments based on costs, (4) financing for supplies or services under sole-source acquisition through either PBP or progress payments based on costs (but not both), (4) financing of contracts for supplies or services through advance payments in accordance with Subpart 32.4, (5) financing of contracts for supplies or services through guaranteed loans in accordance with Subpart 32.3 or (6) financing of contracts for supplies or services through any combination of advance payments, guaranteed loans, and either PBP or progress payments (but not both) in accordance with applicable subparts (FAR 32.113).

This section focuses on the fourth of the customary methods, since the major defense acquisition programs (MDAPs) discussed in this thesis are sole-source acquisitions for supplies awarded via fixed-price contracts. Consequently, customary contract financing arrangements are limited to either PBP or progress payments based on costs. A detailed discussion of PBP follows the descriptions of non-commercial item purchase financing methods.

Progress payments based on costs provide contract financing for work-in-process (uncompleted work that is in the production process) expenditures on fixed-price Government contracts. "Progress payments are designed to alleviate undue strain on a contractor's cash flow and provide interim financing as progress occurs" (Financial 2). Actual payments for progress payments are based on a percentage of costs incurred.

Customary progress payment rates vary in accordance with established lending rates and the size of the business. The Defense Federal Acquisition Regulation Supplement (DFARS) 232.501-1, designates a customary progress payment rate as 75 percent (large business) of a contractor's aggregate costs. Actual cost data is reported through progress payment invoices that the contractor provides. These invoices summarize total costs incurred on a contract as of a specific date. Progress payments are liquidated based on the rate established in the contract (Financial 2).

In the event that a PCO determines that it is advantageous to provide financing to a contractor, but that private financing or progress payments based on cost are not practical or feasible, loan guarantees by the Government would be the next preferred method of contract financing.

### **3. Loan Guarantees**

Loan guarantees are revolving credit funds, loans or any other financial arrangements that are backed by the full faith and credit of the United States Government. Such arrangements are usually for less than 100 percent of the loan amount, and the loan guarantee is given to a financial institution (e.g., bank) instead of being given to the contractor (Government) [Contract Financing for the Purchase of Noncommercial Items].

### **4. Unusual Progress Payments**

This method of financing is defined as "any contract financing arrangement that deviates from this part [subpart 32.1 - Non-Commercial Item Purchase Financing] and is unusual contract financing" (FAR 32.114). When a contractor obtains a progress payment rate higher than the customary rate (e.g., above 75 percent for a large business) or pays more frequently than monthly, an unusual progress payment is demonstrated.

### **5. Advance Payments**

Advance payments are payments that are given to a contractor without regard to expense or progress. FAR Subpart 32.4 [Advance Payments for Non-Commercial Items] states that advance payments are the least preferred method of contract financing and that they should be used sparingly. These payments are made in anticipation, or to

complete performance (Government) [Contract Financing for Purchases of Noncommercial Items].

Now that the contract financing alternatives for the purchase of non-commercial items have been discussed, the thrust of the paper will shift towards looking at PBP. Performance-Based Payment policy will be the first topic addressed.

#### C. PERFORMANCE-BASED PAYMENT POLICY

##### 1. Federal Acquisition Streamlining Act of 1994

In October 1994, President Clinton signed Public Law 103-355 [a.k.a. Federal Acquisition Streamlining Act (FASA) of 1994] into law. FASA [Sections 2001(b) and 2051(b)] created a new financing technique for non-commercial items that based payments on contractor performance as measured by: (1) objective and quantifiable results or (2) accomplishments of events or (3) "other quantifiable measures of results" ("Public"). This new form of contract financing was called Performance-Based Payments.

The Federal Acquisition Regulatory Council issued Federal Acquisition Circular (FAC) Number 90-33 in September 1995 to amend the FAR and to implement sections 2001 and 2051 of FASA. These subsections substantially changed the statutory authorities for the Government financing of contracts. FAC 90-33 authorized the Government to provide contract financing for non-commercial items on the basis of

measurements of the contractor's actual performance of the contract. Further, these changes created a fundamental distinction between the financing of purchases of commercial and non-commercial items. As a result, the subparts of FAR Part 32 (Contract Financing) were broken down into three distinct categories:

- Subparts applicable to both commercial and non-commercial financing;
- Subparts applicable to only commercial financing; and
- Subparts applicable to only non-commercial financing (Contract).

Since the FAR change in 1995, this form of contractor financing has become an increasingly popular means of financing. Bob Bemben, an employee in the Cost, Pricing and Finance Directorate in the Office of the Under Secretary of Defense for Defense Procurement [OUSD(A&T)DP], and Chairman of the Defense Contract Finance Committee, said that this is especially true when one looks at the dollars involved in major defense acquisition programs (MDAPs). He stated that the only contracts that he was aware of that were using PBP were all on MDAPS such as the B-2, C-17, F-16, F-22, FMTV, E-2C, and Apache Longbow programs (12 Mar.).

Figure 2.1 depicts the use of PBP from August 1997 to August 1998. During this timeframe, the DoD made approximately 300 PBP valued at \$2.9 billion, and approximately 30,000 cost-based progress payments valued at \$14.9 billion.

Consequently, the passage of FASA lead to some significant changes in the way the Government provides contract financing. The payment for performance vice costs incurred for non-commercial items was a significant change for the DoD, but it is consistent with the acquisition reform movement towards less Government oversight. Preliminary research indicates that the PBP method of financing has thus far been limited in the DoD to large MDAPs and is becoming increasingly popular.

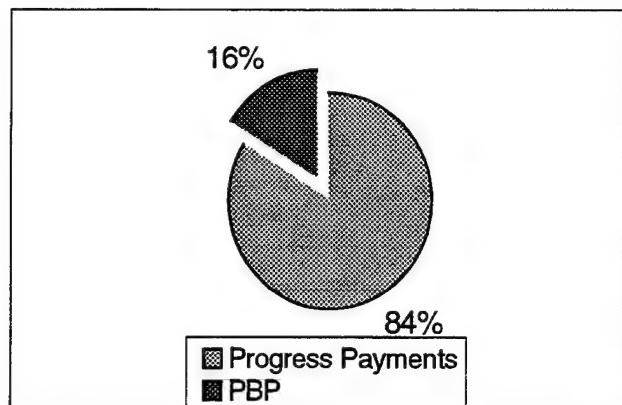


Figure 2.1: PBP Volume Usage (Guinasso 23 Jan.)

## 2. FAR Subpart 32.10 "Performance-Based Payments"

FAR Subpart 32.10 provides policy and guidance applicable to PBP. First, PBP are a form of contract financing -- not a payment for an item which has been accepted. Second, PBP cannot be utilized with any other form of contract financing, but they are fully recoverable in the event that a contractor using this form of financing defaults. Third, since PBP are contract financing payments, a contractor is not entitled to accrue interest for late

payment. Fourth, this is the preferred method of contract financing when both the Government and the contractor agree to use PBP and find them practical (FAR 32.1001).

The FAR language on PBP is not limited to the aforementioned. Specifically, this subpart contains guidance which restricts the use of PBP and procedures for using PBP.

**a) *PBP Restrictions***

PBP are generally used on definitized, fixed-price type contracts awarded to sole source contractors. This form of financing cannot be used on: (a) cost-reimbursement contracts, (b) contracts for architect-engineering services or construction, or for shipbuilding or ship conversion using payments terms based on percentage or stage of completion, (c) research and development contracts, or (d) contracts awarded through sealed bid or competitive procedures (FAR 32.1000).

**b) *Procedures***

There are three factors necessary to define PBP payment terms: (1) the payment event, (2) the definition of successful completion and (3) the value of the event. All three conditions must be considered together to ensure that the contractor has adequate cash flow, that there is the proper level of motivation for the contractor, and that

achieving the payment events will lead to successful contract completion. Further, this requires an in-depth knowledge of the contractor's product and processes as well as close cooperation between technical and financial disciplines ("Negotiating").

Moreover, the contracting officer (CO) is responsible for "establishing a complete, fully defined schedule of events with associated criteria and payment amounts." The payment events can either be made on a deliverable item or on a whole contract basis (Muskopf).

Well-crafted payment events have a variety of common characteristics.

They are clear milestones in the path toward the ultimate completion of the contract, they represent a physical change in the product, they indicate added value, and they are not surrogates for incurred costs" ("Negotiating").

If PBP payments are made on a delivery item basis, each event or performance criterion shall be identified to a specific contract line item or subline item. These payment events can be either severable or cumulative; however, if severable, the events must be specifically identified in the contract (FAR 32.1004).

Placing long lead time material on order would be an example of a severable event. Such an event is not dependent upon the accomplishment of another event or criterion. Conversely, in order for a cumulative event to

be accomplished, another event must have been successfully completed. For example, attaching an aircraft wing to a fuselage.

Payment events shall not exceed 90 percent of contract price or delivery item price. Moreover, the amount of each PBP payment shall be stated either as a percentage of a specifically identified price (e.g., contract price, or unit price of the deliverable item) or as a dollar amount (FAR 32.1004).

In addition, the contracting officer (CO) is responsible for ensuring that the contract price is fair and reasonable. This entails ensuring that the financing costs to the Treasury of using PBP are considered as well as other factors (FAR 32.1004).

The CO is responsible for establishing the basis for the PBP amounts based on any rational basis, but not limited to engineering estimates of stages of completion, engineering estimates of hours, and the estimated projected cost of performance of particular events (FAR 32.1004). Another way of selecting payment events is to diagram the process flow of the product and select the important events that contribute to completion of the product. For example, the events can "represent milestones of progress, the joining of wings to an aircraft fuselage, or because of

their criticality toward the delivery of the final product, machining sabots for antitank munitions" ("Negotiating").

Throughout the process COs must remember that PBP are a form of contract financing, and they are subject not only to FAR 32.1/32.10 [PBP/non-commercial financing].

Payment amounts should represent what the contractor could reasonably be expected to incur to achieve the payment event, rather than resemble advance payments or an inducement for the contractor to achieve performance levels that exceed contract requirements (Spector).

Not all procurements lend themselves to this form of financing, since one must have events which are both clearly identifiable, measurable and contribute to the product or service being purchased. Additionally, by its very nature if a contract does not have these spelled out, it cannot utilize PBP since the events are not definitized. Despite these challenges, there are advantages to the contractor and the DoD with this form of financing.

#### **D. ADVANTAGES OF PBP**

From the contractor's perspective there are at least three benefits of using PBP. Refer to Figure 2.2. First, traditional progress payments (based on cost) are limited to 75 percent of cost versus 90 percent of price for PBP. This is significant because the higher ceiling leads to the second advantage, improved cash flow and recovery of profit earlier for the contractor. Third, PBP do not require a

contractor to have an approved accounting system or to be in compliance with Material Management and Accounting System (MMAS) (Guinasso, PBP).

Based on preliminary research it appears that from the DoD's perspective the most important benefit of using PBP is that the DoD is providing financing payments based on tangible contract progress versus costs incurred. An analogy would be in the case of a homeowner establishing predefined events for a kitchen remodeling job (e.g., delivery of materials to the job site, sanding/painting cabinets, etc.). This would be preferable to paying the contractor a percentage of his incurred costs each day.

- |            |   |
|------------|---|
| Contractor | <ul style="list-style-type: none"><li>• Higher ceiling (90% of price vs 75% of costs)</li><li>• Improved cash flow</li><li>• Less oversight</li></ul> |
| DoD        | <ul style="list-style-type: none"><li>• Paying for tangible performance vs. costs incurred</li><li>• Easier to administer</li></ul>                   |



Figure 2.2: Advantages of PBP (Guinasso, PBP)

Administration of PBP is less taxing than progress payments based on costs, because the Government auditors and in-plant representatives do not have to review any progress payment requests. In addition, they do not have to verify that the contractor made an expenditure for goods or

services. Costs are not eligible for progress payments until they are paid. The Government's in-plant representatives no longer have to monitor progress payments to ensure that payments are not getting ahead of the work in-process. However, Government representatives have to verify specified performance has been completed prior to authorizing a PBP.

#### **E. DISADVANTAGES OF PBP**

Performance-based payments are not a panacea; there are drawbacks to utilizing this form of contract financing. Refer to Figure 2.3. First, PBP are currently restricted to sole-source acquisitions for non-commercial items and cannot be used in conjunction with progress payments. Moreover, William Stoughton points out that the use of PBP requires a contractor to "structure its performance-based payment events, payment amounts, and planned cash flow so that all payments to subcontractors [and its own internal needs] are satisfied" (128). Thus, a prime contractor could not make a performance-based payment to a subcontractor and be reimbursed directly from the Government for the full amount of that payment (Stoughton 128). Consequently, this form of financing requires significant advanced planning since unlike progress payments based on incurred costs, a contractor's cash flow will be dependent upon accomplishing payment events vice just incurring costs.

A second disadvantage arises when a dispute occurs over whether an event has been successfully completed. This is particularly a concern for a contractor in the event that the contract calls for cumulative events. The use of a cumulative event could adversely impact payments for subsequent events (Stoughton 127).

Contractor	<ul style="list-style-type: none"><li>• High degree of initial planning</li><li>• Government imposed delays</li><li>• Dispute over completion of payment events</li></ul>
<i>DoD</i>	<ul style="list-style-type: none"><li>• High degree of initial planning</li><li>• Potential to create unrealistic and unmeasureable events</li><li>• Potential to provide too much financing</li></ul>

Figure 2.3: Disadvantages of PBP (Muskopf and Guinasso, PBP)

Another concern for a contractor is Government caused delays, which can cause an interruption in cash flow. Since PBP are a form of contract financing and not payment, they are not subject to the Prompt Payment Act, and the contractor is not entitled to interest on delayed PBP amounts (Stoughton 128). However, regulations state:

...if there is a Government-caused delay, the contracting officer may renegotiate the performance-based payment schedule, to facilitate contractor billings for any successfully

accomplished portions of the delayed event or criterion (FAR 32.1007).

Thus, "the contractor's legal remedy requires filing of a Contract Disputes Act claim and the accrual of interest on that claim" (Stoughton 128). In any event, the contractor's cash flow will be disrupted (128). Thus, a contractor will have to prepare and submit a request for equitable adjustment to procuring contracting officer (PCO) for review and consideration.

A common disadvantage to both the Government and the contractor is that PBP requires a lot of initial planning. Such planning is necessary, since "the selection [and pricing] of performance based events will determine the success or failure of a performance-based financing plan" (Stoughton 125).

Janice Muskopf, a defective pricing analyst for the United States Air Force's (USAF) Aeronautical Systems Center Contracting Directorate, believes that there are several "pitfalls" associated with PBP. First, the CO may create unrealistic, unmeasureable payment events that do not reflect performance. Further, providing financing in excess of a contractor's cost (plus a reasonable profit without ample rationale) is a hazard to avoid. Finally, lack of substantiating documentation is a concern (Muskopf).

To clarify the DoD's policy on PBP and to address some of these concerns, the Director of Defense Procurement,

OUSD(A&T)DP issued a policy memorandum in November 1998. To determine an appropriate level of financing, COs are encouraged to obtain expenditure forecasts as part of their evaluation of PBP. Further, to mitigate the DoD's risk of making PBP greater than a contractor's actual costs, COs are encouraged to establish payment amounts which do not exceed the projected value of tangible property (Spector).

There are a myriad of advantages and disadvantages which must be considered when contemplating the use of PBP. One of the most effective ways to illustrate many of these attributes is by looking at a comparison of PBP and progress payments based on costs.

#### **F. NOTIONAL CONTRACT - USING PBP AND PROGRESS PAYMENTS**

To illustrate the impact of using PBP, the author modified a simplistic model that Richard Wall and Robert Gustin used effectively in an article for CP&A Report (12). The model assumes a 40-month firm fixed-price contract with delivery occurring at the end of the period. Other assumptions include:

Contract Price	\$13,200,000
Contract Cost	\$12,000,000
Contract Profit (10%)	\$1,200,000
Monthly Costs Incurred	\$300,000
Progress Payment Rate (of Cost)	75%
Performance-Based Payment Rate (of Price)	90%
Contractor's Interest Rate	8.25%

If the monthly progress payments were used in lieu of PPB under the above assumptions, the Government would make 40 monthly payments of \$225,000 (75 percent progress payment rate on \$300,000 cost incurred). The present value of this cash flow discounted at 8.25 percent is \$7,845,146.

If the Government CO finds PBP practical and the contractor agrees to the use of PBP instead, the present value of the cash flow depends on the periodicity and amount of payment events. Figure 2.4 shows what the present value of PBP is for a range of variables at 8.25 percent interest for 5, 10, 20, 30 and 40 equal and equidistant payment events (in reality, payments events would probably not be equidistant but would be based upon specific milestones).

Figure 2.4 shows that the present value of cash flows from PBP greatly exceed the monthly progress payments. As the number of payment events decrease under PBP, the marginal advantage of this form of financing decreases. In this example the use of PBP is equivalent to having progress payment rates ranging from 84.55 percent (5 payments) to 86.30 percent (40 payment events).

This example clearly illustrates one of the primary advantages of using PBP from a contractor's perspective, improved cash flow. It is important to realize that not all PBP payments are negotiated at 90 percent and that cost

overruns by the contractor, and/or missing payment events can adversely impact a contractor's cash flow.

Progress Payments		Performance-Based Payments		
Number of Payment Events	Present Value of Cash-Flow	Number of Payment Events	Present Value of Cash-Flow	Cash-Flow Advantage
40	\$7,845,146	40	\$10,355,592	\$2,510,447
		30	10,345,351	\$2,500,205
		20	10,324,951	\$2,479,806
		15	10,304,688	\$2,459,543
		10	10,264,410	\$2,419,265
		5	10,146,196	\$2,301,050

Figure 2.4: PBP, Present Value of Cash Flow Analysis (Wall)

Defense Contract Management Command (DCMC) usually has in-plant representatives located at DoD's large defense contractors. Their job is to be the "eyes and ears" for the PCOs. Specifically, they can help provide buying activities with insight into a defense contractor, and administer contracts on behalf of buying commands (e.g., Naval Air Systems Command), etc.

#### G. ADMINISTRATION OF PBP

The responsibility for the administration of DoD contracts with PBP resides with the DCMC (One Book 1). The governing instruction for the administration of PBP is contained in chapter 4.5.3 (PBP) of the Defense Logistics Agency Directive (DLAD) 5000.4, also known as the One Book. Figure 2.5 details the DCMC's actions with contracts having PBP (One Book 1).

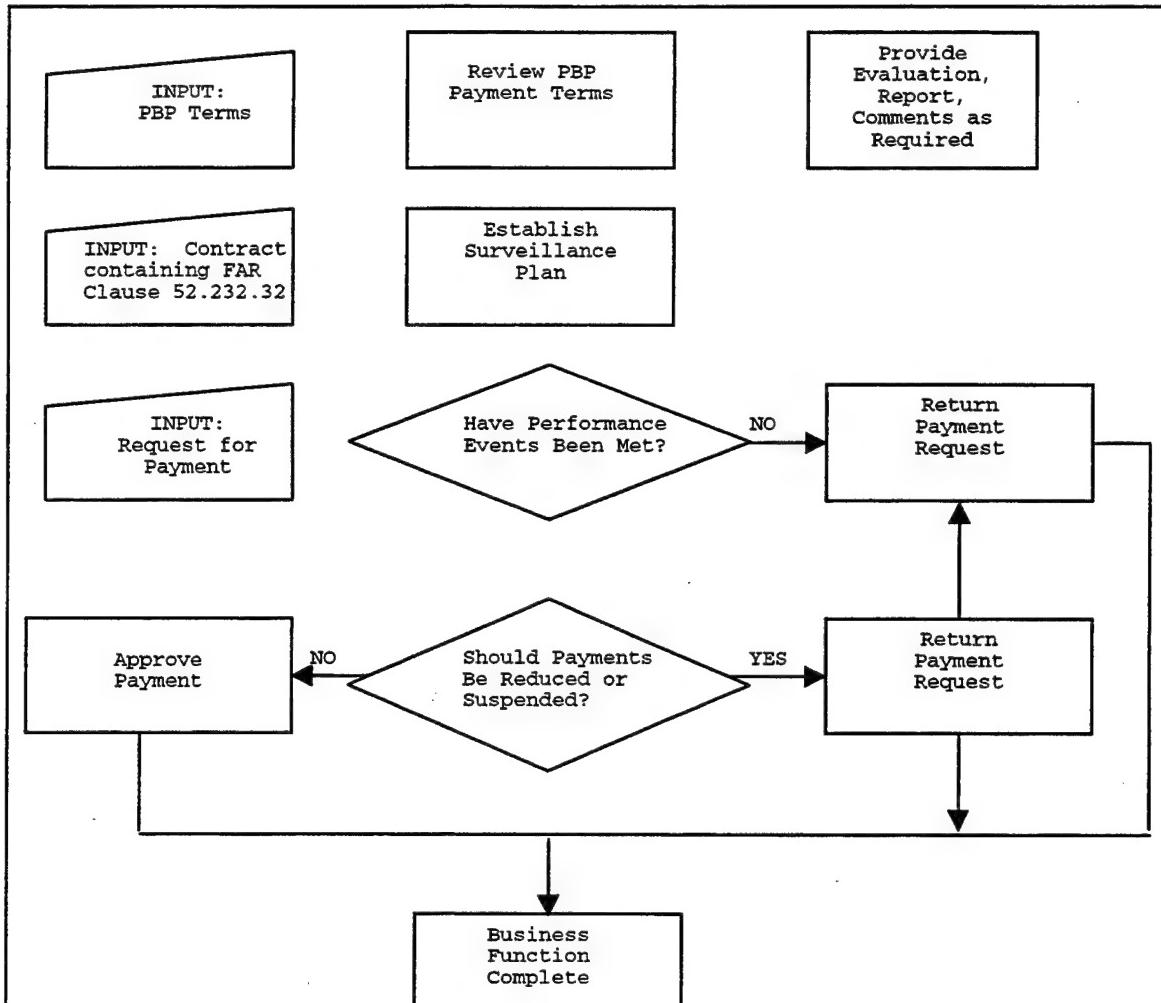


Figure 2.5: PBP Administration (DLAD 5000.4)

The first step in the process is for early contract administration involvement with the Procuring Contracting Officer (PCO). This step is necessary to ensure the smooth administration of future payments. Upon receipt of the contract from the PCO, the Administrative Contracting Officer (ACO) reviews the PBP terms in the contract. Next, the ACO develops a surveillance plan which identifies "how the performance or event will be verified, by whom, in what

form the data is to be presented by the contractor, what types of reviews will conducted and what frequency" (1).

For an example of an actual surveillance plan, refer to Appendix A.

The third step in the PBP administration process shifts to reviewing requests for a performance-based payment. The ACO reviews the contractor's request and ensures that it conforms to the "approval and payment of requests" section of FAR 32.1007(c).

The fourth step entails approval of the payment request. Payment cannot be made until an event has been successfully accomplished in accordance with the contract. It is the ACO's job to make certain that this has occurred. The ACO may seek the assistance of technical specialists and others to substantiate the successful performance criteria or event (2).

As part of his review, the ACO is responsible for reducing or suspending PBP, liquidating PBP by deduction from any payment under the contract, or any combination above upon finding substantial evidence of the following conditions:

- The contractor fails to comply with any material requirement of the contract.
- Performance is endangered by the contractor's failure to make progress or unsatisfactory financial condition.
- The contractor is delinquent in payment to any of his subcontractors or suppliers (FAR 52.232-32(e)).

As has been discussed, DCMC and the ACO play a significant role in the administration of PBP. Their familiarity with a contractor's products, services, and processes make them an indispensable tool to a PCO who is contemplating using PBP on a contract.

Since PBP have been authorized since 1995, both the Government and industry have had the opportunity to use this method of contract financing and formulate ideas for improving its use. Recently a proposed rule was issued which may change the current FAR requirements on PBP.

#### **H. PROPOSED CHANGES TO PBP**

A proposed rule (FAR case 98-400) to change progress payments and related financing policies (which includes PBP) was published in the Federal Register on February 10, 1999. If the FAR is eventually amended to include these changes, the PBP method of contractor financing will be used more frequently in the DoD. PBP use will be expanded by permitting this method of financing in contracts for research and development, and contracts awarded through competitive negotiation (Federal Register 6758-6759).

The OUSD(A&T)DP policy memorandum discussed in section E of this chapter foreshadowed many of the proposed changes. The aforementioned proposed rule emphasizes that PBP "are the preferred method of financing" and that "their use

should be considered and deemed impracticable by the contracting officer before a decision is made to provide customary progress payments." Similarly, the proposed FAR financing change stresses that PBP are financing, and that payment events should not resemble an "advance payment or a reward" for contract performance ("Federal" 6759).

If this proposed rule is implemented, the PCO will probably have to perform a net present value (NPV) analysis of the proposed event payments for each offeror as part of his evaluation process for competitive negotiated contracts to assess the financing cost of the contractors' proposals. Thus, this will be an additional evaluation criterion which the PCO must clearly delineated in the Government's solicitation. Expanding the use of PBP gives the DoD more financing options that it may utilize to provide contract financing and is consistent with the Government's acquisition reform efforts.

## I. SUMMARY

PBP have been successfully utilized by the DoD since it was implemented in the FAR as a result of FASA. Although currently restricted to fixed price, noncompetitive negotiated procurements, PBP have become an increasingly popular method of contract financing. FAR subpart 32.10 provides the guidance on PBP, covering its restriction and procedures for its use. This method of contract financing

has advantages and disadvantages that must be considered by both potential offerors and the PCO.

Chapter III will discuss how three MDAPs are using PBP. The discussion will be based upon a review of the pertinent literature available, applicable sections from respective contracts, and conversations with DoD and contractor representatives.



### **III. PROGRAMS**

This chapter summarizes how three major defense acquisition programs (MDAP) are using PBP. The purpose of the chapter is two-fold: (1) to provide the reader with an overview of the programs; and (2) to identify the nature of the PBP evaluation process.

#### **A. C-17 TRANSPORT PROGRAM**

##### **1. Program Overview**

The C-17 is the United States Air Force's (USAF) newest strategic airlift aircraft built by Boeing-McDonnell Douglas (BMD). This aircraft was designed to replace the Air Force's aging fleet of C-141 transports and complement the larger but less maneuverable C-5 aircraft. When the program began in 1982 the USAF originally planned to procure 210 aircraft. However, the fall of the Soviet Union, and a subsequent review of aircraft requirements by the Secretary of Defense (SECDEF) in 1990 reduced the program to 120 aircraft (Military Airlift 2).

In 1993, due to a series of ongoing concerns about cost growth and technical troubles, the SECDEF announced that the program would be stopped at just 40 aircraft unless these problems were adequately addressed. Further, in 1994 Congress directed the DoD to initiate a study to determine if a commercial aircraft such as the Boeing 747 could be

used as an alternative or supplement to the C-17 (Military Airlift 2).

The Defense Acquisition Board (DAB) decided in October/November 1995 to procure 120 C-17s (full-rate production) and no commercial transports. The DAB based its decision largely on studies done by Air Mobility Command and the Joint Chiefs of Staff (Military Airlift 2). In a separate action in 1996, the USD(A&T), and subsequently Congress, approved a seven year multiyear procurement (MYP) plan to procure the last 80 of the 120 C-17 buy (13). Figure 3.1 shows the production schedule for the last 80 aircraft, production lots IX through XV (1997-2003).

Fiscal year	1997	1998	1999	2000	2001	2002	2003
Number	8	9	13	15	15	15	5

Figure 3.1: C-17 Multiyear Production Schedule  
(Military Airlift 15)

The PCO for this program stated that Alpha Contracting was utilized. This gave the Air Force significant insight into the contractor's cost structure and processes (Vangsness 7 May).

Alpha Contracting refers to the teaming of the Government and the Contractor during the early states of the acquisition process... One of the functions of teaming is to identify duplicative, burdensome, and costly oversight requirements which do not provide value added to the Government. Making the Contractor part of the planning process allows them to acquire a better understanding of actual Government requirements and, as a consequence, propose more cost effective and innovative solutions... (Owens).

The C-17 program is a 1998 winner of the Malcolm Baldridge National Quality Award (see Appendix B). This material is relevant to the study of PBP, since it provides additional insight into the contractor's managerial processes of a highly regarded program and contract using PBP.

## **2. Contract Specifics**

Prior to the full rate production decision by the DAB in 1995, the USAF had contracted with McDonnell Douglas (MD), under seven production lots to produce 32 aircraft. During the probationary period the Air Force negotiated four sole-source contracts which covered aircraft production, program and product improvement, and support (Military Airlift 13). These are explained as follows:

The four contracts were (1) a producibility enhancement/performance improvement (PE/PI) contract for funding projects aimed at reducing production costs and for funding C-17 performance capability improvements; (2) a field support contract to provide for depot repair and management and sustaining support to maintain fielded aircraft in operational condition (including retrofitting aircraft, repairing parts, and procuring support equipment, and spare parts); (3) a single-year contract for production lot VIII, increasing the number of C-17s under contract from 32 to 40; and (4) a multiyear contract for the next 80 aircraft that increased the number of C-17s under contract from 40 to 120 (Military Airlift 14).

In February 1996, the USAF and MD agreed to a \$1.9 billion firm fixed-price (FFP) contract for the production

of eight aircraft under production lot VIII. This contract, referred to as the "lot VIII and beyond contract," also contained separate FFP options for production lots IX through XI, fiscal years 1997 - 1999. In addition, the "lot VIII and beyond contract" included separate options with "not to exceed" prices for the remaining production lots (Military Airlift 15). However, as a result of the MYP decision, the USAF changed "lot VIII and beyond contract" from single year options to a multiyear contract (15). In 1997 MD merged with Boeing.

### **3. Performance-Based Payments**

A contract specialist with BMD who has been involved with the C-17 program since 1996 stated that he believed that the suggestion to use PBP on the MYP came from the Air Force. This suggestion was made after MD's request to receive "unusual progress payments," equal to 100 percent of cost, was denied. The contractor requested "unusual progress payments," because they were concerned how they could make this program profitable while absorbing the costs associated with significantly lowering the price of the aircraft by approximately 5.5 percent in a multiyear contract (Morrison).

It should be noted that one of the contract clauses in section H (Special Contract Requirements) states it is the intent of "the parties to establish the 'value' of the

payment events based upon reimbursement of 100% of the overall projected multi-year cost expenditure." Thus, even though the contractor's request for "unusual progress payments" was denied, they were still able to achieve the same result by using PBP.

Section H of the C-17 MYP contract discusses the use of PBP. Essentially, this section stipulates two major uses of PBP in this contract. The first deals with PBP for aircraft in this contract, and the second addresses various Economic Order Quantity (EOQ) projects. Lastly, section H stipulates that the PBP schedule will be reviewed annually (Section H).

There are a total of six individual performance events per aircraft plus a final delivery payment. Refer to figure 3.2 for a list of the individual performance events. The PBP for the transports are made on a deliverable item basis. The contract specifies whether the payment events will be cumulative or severable events, and the associated completion criteria for each payment event. Thus, the payment events and the criteria for successfully completing these events are detailed in the contract (Section H).

EVENT NUMBER	PAYMENT EVENT
1.	Main Landing Gear Bulkhead Frames Rough Machined. (Severable)

Figure 3.2: Aircraft Event Criteria (C-17 Contract)

EVENT NUMBER	PAYMENT EVENT
2.	<u>For Aircraft P41 through P48:</u> Section Five (Center) Floor Rails and Details Received. (Severable)  <u>For Aircraft P49 and Subsequent:</u> Aft Pressure Bulkhead Assembly Details Received. (Severable)
3.	Completion of Spars. (Severable)
4.	Completion of Wing Half Sub-Assemblies. (Cumulative)
5.	Completion of Forward, Center, Aft And Wing Sections. (Cumulative)
6.	Completion of Final Assembly. (Cumulative)
7.	Aircraft Delivery (Liquidation Event).

Figure 3.2: Aircraft Event Criteria (C-17 Contract)  
(Continued)

For example, for event number four from Figure 3.2, Figure 3.3 illustrates what constitutes a success criteria and verification for the completion of wing half sub-assemblies.

SUCCESS CRITERIA	VERIFICATION
Wing halves are moved out of Dept. 17B assembly and tooling and ready for wing join. Ninety-five percent (95%) of department 17B planned standards complete. This is the first cumulative payment event for each aircraft and is dependent upon the completion of event number three (3).	This will be recorded on an Event Assembly Order with signature/stamp by USAF Airlift and Tanker Programs (A&T) and DCMC representatives. A&T's existing Management Control/Statusing System will be used to verify the planned standards complete.

Figure 3.3: Success Criteria and Verification (C-17 Contract)

The second area where PBP are being utilized in this contract is for Supplier/Inter-Component Work Order (ICWO) EOQ and Contractor/Supplier/ICWO Affordability Projects. There are 20 EOQ projects in the section of this contract. However, through mutual agreement between the contractor and the government, additional project costs can be incorporated into the existing EOQ PBP event values or additional PBP events can be added (C-17 Contract).

The PCO stated that the EOQ projects are unique to a multiyear contract. These projects were intended to help MD reduce the cost of the airplane so that they could meet multiyear targets (Vangsness 7 May).

The C-17 MYP contract requires that the PBP schedule be reviewed on an annual basis to ensure that the fair value payment amounts for future payment events are maintained (Section H). Both the USAF and MD believed it was in the best interest of both parties to include this requirement in the contract. The annual review is not a FAR requirement.

The performance events, amounts and success criteria shall be adjusted by mutual agreement if a contract action or the contractor's performance has significantly affected the performance payment schedule (Section H).

Both the PCO and contractor representative with whom the researcher talked viewed this clause as being advantageous to ensure that one party was not benefiting at the expense of the other. These individuals did not see how one could

have a multiyear contract without having a similar capability.

## **B. E-2C "HAWKEYE" AIRCRAFT PROGRAM**

### **1. Program Overview**

Designed and built by Northrop Grumman Corporation, the E-2C Hawkeye is an airborne early warning/command and control aircraft that has been used by the U.S. Navy since 1973. Its primary mission is to extend the radar horizon of ground-based and shipboard radar systems. The Hawkeye is expected to serve the Navy well into the next century. Therefore, the system continues to receive improvements in detection, processing, identification, communications and navigation ("E-2C Hawkeye Early").

The E-2C was produced at Northrop Grumman (NG) Corporation's Bethpage, New York plant until the early 1990s when the production line was shut down (O'Connell 27 Mar.). In 1994 NG subsequently restarted its Hawkeye production line in St. Augustine, Florida after the Navy ordered the first four of an expected 36 new Group II E-2Cs ("E2-C Hawkeye"). The E-2C+ as the new version is commonly called, has radar improvements, software upgrades, and more powerful engines ("E-2C Aircraft").

### **2. Contract Specifics**

In December 1994, the Navy and NG signed an advanced acquisition contract for the production of four aircraft in

1995 and five aircraft (two aircraft were for France) in 1996 (option) (O'Connell 22 Mar.). Separate FFP contracts were also used for fiscal years 1997 and 1998 production buys. Refer to figure 3.4.

Fiscal year	1997	1998	1999	2000	2001	2002	2003
Number	4	4	3	3	5	5	5

Figure 3.4: E-2C Multiyear Production Schedule ("FY99 Budget Materials" and "FY 2000 Highlights Book")

There are four aircraft in the FY98 contract; however, one was added after the contract was awarded. The fourth aircraft came so late for fiscal year 1998 that it is not part of the three aircraft production contract. The Navy obtained permission from Congress to purchase 21 E-2C's for fiscal years 1999 - 2003 using a MYP contract (O'Connell 22 Mar.). On April 27, 1999 NG was awarded a \$1.3 billion, five year contract to produce 22 Hawkeyes for the U.S. Navy. Of the 22 aircraft, one will be sold to France ("Northrop").

### **3. Performance-Based Payments**

The Navy and NG have used PBP on three of the aforementioned E-2C+ production contracts. The first contract, FY95/FY96, initially used progress payments since the FAR stipulates that PBP cannot be used on undefinitized contracts. In June 1996, both parties agreed to modify this contract (N00019-94-C-0020) to use the PBP method of contractor financing. To accomplish this, the contractor refunded all progress payments it had received up to this

date; hence, the contractor was immediately reimbursed upon the completion of the first PBP event (FY95/96 contract finance modification).

The 1997 and 1998 production contracts also started out using progress payments but were subsequently modified to change the finance method to PBP. The later contract was just for three aircraft, since Congress added the fourth after the contract was awarded (O'Connell 22 Mar.). The PCO stated that the MYP for the fiscal year 1999 - 2003 production buys will use PBP once the contract is definitized (O'Connell 7 May). This research will focus on the FY98 production contract, since it is the most recent definitized E-2C production contract to use the PBP of contractor financing.

Section G (contract administrative data) of the FY98 production contract was modified to change the contract finance method from progress payments to PBP. The contract stipulated that an 83 percent payment rate would be applied to the price of each of the remainder of the payment events. The quantity of events varies from month to month based on the "manufacturing critical flow path." Consequently, in the event that it is not completed the payment amount for that month will be adjusted (FY98 contract finance modification).

The contract modification (N00019-97-P7-ZA876) also stated that the first PBP event(s) reflect:

a 'onetime adjustment' of all previous payments based on costs, delivery and unliquidated progress payments for work accomplished prior to converting Contract N00019-96-C-0195 to performance-based payments via this modification... (FY98 contract finance modification).

Thus, the contractor returned the contract financing which he received while using progress payments then immediately received them back as PBP upon completion of the first event. Further, the contract modification defined successful performance of an event as a specific event that could be moved to the next station for the purpose intended without requiring any disassembly at a later time to install any items not previously installed (FY98 contract finance modification).

Although all three aircraft in this production contract did not have identical payment events, there are nine events common to each. The common events that the airframe share include: (1) keels, (2) quads, (3) lower forward structure, (4) forward section, (5) combat information center cabinet, (6) rotodome buildup, (7) pylon, (8) final paint, and (9) first airframe flight. Upon the final production test flight of each aircraft, a liquidation payment is made consistent with the 83 percent payment rate (FY98 contract finance modification).

Because of his unfamiliarity with the aerospace industry, the author asked the ACO and the Manager for Contracts and Pricing for the E-2C Program whether the payment events were clearly understood. Both individuals responded that the contractor and the Government clearly understood the manufacturing process and have not encountered any difficulties by not providing a definition of PBP events.

#### C. FAMILY OF MEDIUM TACTICAL VEHICLES (FMTV) PROGRAM

##### 1. Program Overview

The Family of Medium Tactical Vehicles (FMTV) program is one of the Army's largest acquisition programs at a cost of \$15.7 billion. From fiscal years 1991 through 2022, the Army plans to purchase approximately 85,500 FMTV trucks to replace its existing aging medium truck fleet. The FMTV family consists of 2.5-ton (capacity) and 5-ton trucks in various configurations (Army Medium Trucks: Acquisition 2).

The FMTV program consists of a complete series of trucks and trailers based on a common frame but varied payloads and functions. The Light Medium Tactical Vehicle (LMTV) is the 2.5 ton variant and the Medium Tactical Vehicle (MTV) is a 5 ton variant. There is over an 80 percent commonality between the variants ("FMTV FY00/01").

The FMTV currently in production is a non-development item (commercially modified) based on a truck design

developed by Steyr-Daimler-Puch for the Austrian army. The FMTV acquisition strategy for the first production contract enabled the program to have just two phases - prototype and production. After making a down selection from three contractors, Stewart and Stevenson Services, Inc. received a 5-year fixed-price production contract in October 1991 for 10,843 trucks plus options for additional trucks. Due to a series of problems which were encountered during production and testing, and as a result of congressional interest, the fifth year of the contract was restructured. This portion of the contract was completed in 1998 (Army Medium Trucks: Information 3-4).

The Army has taken steps to develop a second source producer. Oshkosh Truck Corporation and AM General Corporation have been selected to compete for qualification as a second source for the FMTV. This second source could potentially enable the Army to modernize its fleet more quickly as well as lower operation and support costs (Dodson).

Developing a second source is not an inexpensive option. However, it is one of the most effective ways to instill competition and thereby insure that the DoD gets the best product at the best price.

## **2. Contract Specifics**

In October 1998, the Army awarded Stewart and Stevenson a \$1.4 billion second contract to produce approximately 9,000 trucks and 1,500 trailers under a four year fixed, plus one option year contract ("Stewart and Stevenson"). Figure 3.5 shows the quantities and types of vehicles and trailers that the Army has in its OPA1 (Other Procurement Army) FY 98 through FY 01 budget ("FY00/01 OPA1 Budget Material").

<b>Vehicle</b>	<b>FY 98</b>	<b>FY 99</b>	<b>FY 00</b>	<b>FY 01</b>
LMTV	1,044	165	521	924
MTV	135	1,274	1,658	1,653
LMTV Trailers	4	-	32	31
MTV Trailers	4	-	260	260

Figure 3.5: FMTV Schedule ("FY00/01 OPA1 Budget Material")

## **3. Performance-Based Payments**

The FMTV MYP uses the PBP method of contract financing. Section G of the contract contains specific PBP requirements, terms and conditions. The contract specifies that the contractor will maintain a Master Production Schedule (MPS) which will be updated monthly to reflect his current performance plan for the next three months. The MPS is essentially "the delivery schedule of the contract one month prior to delivery to the Government" (Biga 11 May). Liquidation payments occur upon acceptance of each vehicle.

There are a total of four individual performance events per vehicle plus the previously discussed final delivery

payment. Refer to Figure 3.6 for a list of the individual performance events. The PBP payments for the vehicles/trailers are made on a delivery item basis.

EVENT NUMBER	PAYMENT EVENT
1.	Is based on the planning, qualification, selection and placement of purchase orders to support procurement of long lead and common component materials to support the MPS planned build of each vehicle. This event occurs six months prior to each Station 18 planned build.
2.	Is based on the pre-production labor necessary to support each planned vehicle. This event occurs three months prior to each Station 18 planned build.
3.	Is based on material receipt 60 days in advance of Station 18 planned build for each vehicle or materials that have been scheduled in, not received, but committed to the extent that termination liability would be 100 percent. This occurs two months prior to each Station 18 planned build.
4.	Is based on each Station 18 actual build completion.

Figure 3.6: Vehicle Event Criteria (Sec. G, FMTV Contract)

Station 18 is a point along the production line for FMTVs where the vehicles are essentially complete, except for variant unique items. Variant unique items include the wrecker body for wreckers, or a material handling crane on a cargo vehicle with a MHE [material handling equipment capability]. This is a good measurement point for where a vehicle is in the build cycle prior to acceptance (Biga 11 May).

For example, from event number three from Figure 3.4, success is "based on the continued receipt of materials to support the build of vehicles through Station 18." Verification is obtained by reviewing the contractor's material receiving report. The contract specifies that the PBP for this event is 60 percent of each vehicle contract line item number (CLIN) price. Event number three is a

cumulative event and cannot be successfully completed until events one and two are completed (para. G.1.3.1.3).

The contract events are all cumulative. Besides all of the events being cumulative in nature, one of the unique things about this contract is that rather than having a set price per event, payment is determined by applying a pre-established rate to each vehicle CLIN price. The first two events are valued at 10 percent each. Event number three is valued at 60 percent, and event number four is valued at 10 percent. Therefore, the total PBP amount is therefore equivalent to the maximum 90 percent of the price.

There has yet to be a PBP met in this contract. This is of concern to the contractor because the firm has been operating without any infusion of cash for about five months. Consequently, the Tactical Vehicle Systems Division (TVS) is under a lot of pressure by its corporate headquarters to see some inflow of cash. The manager of contracts for TVS said:

We [S&S] count on this contract to pay the bills and we certainly never expect to have 12 or 14 million dollars invested in a financing scheme before we had to make the first truck sale (Loomis).

Both the ACO and the contractor are trying to rectify this situation by clarifying what the PBP events are and what constitutes successful completion of a PBP event (Loomis).

#### D. SUMMARY

This chapter discussed how three separate MDAP contracts from each of the military services have utilized PBP. An overview of each program was provided, and the use of PBP in the production contracts was discussed.

The purpose of Chapter IV is three-fold. (1) to compare and contrast the contracts of the three MDAPs, (2) to analyze the impact of using PBP on a contractor's cash flow, and (3) to present the results and analyses of interviews conducted with Government and industry personnel involved in the management of PBP.



## **IV. ANALYSIS OF THE DATA**

### **A. INTRODUCTION**

This chapter builds on the previous chapter by first performing a descriptive analysis of the similarities and differences between the three major defense acquisition programs (MDAPs) discussed in this thesis. Secondly, a cash flow analysis using one of the MDAPs is conducted using the actual performance-based payment (PBP) schedule from the contract. Notional costs and progress payments are used in this analysis as well as actual PBP data extracted from the mechanization of contract administration services (MOCAS) data base. Such an illustration shows various possible outcomes and its potential to impact a contractor's cash flow. The chapter concludes with a synopsis and analysis of telephone interviews conducted with Department of Defense (DoD) and contractor representatives involved in PBP management.

### **B. SIMILARITIES AND DISIMILARITIES OF CONTRACTS**

Of the three MDAPs examined two are for aircraft, and one is for trucks and trailers. Moreover, two of the contracts, the Family of Medium Tactical Vehicles (FMTV) and C-17 transport, are multi-year (MY) procurements. The fiscal year (FY) 1998 E-2C contract is for an annual production buy.

The quantities of items under contract for each of the three programs differ greatly, from a low of just three E-2Cs for the Navy to 9,000 trucks and 1,500 trailers for the Army. The C-17 MYP is for 80 transports. This equates to approximately 150 trucks per month as compared to three to fifteen aircraft respectively annually for the E-2C and C-17.

The FMTV contract is unique, in respect to the other two programs, because the four PBP events are all cumulative. The E-2C and C-17 have a combination of both cumulative and severable events.

Another unique aspect of the FMTV, previously mentioned in Section C of Chapter III, is that the PBP events are priced as a percentage of the vehicle contract line item number (CLIN) price. The reason the contract does not specify a specific dollar amount for each of these events is because unit prices did not exist at the time that the contract was being negotiated (Biga 18 May). The PBP events and prices, although stated as a percentage of each vehicle CLIN price, were definitized prior to contract award.

The Navy does not use this approach in its FY98 E-2C production buy. This contract started out as an advanced procurement using progress payments. Once the PBP events were selected and the prices were established [the PBP

events were definitized], the contract was modified to change the form of financing to PBP. Utilizing this approach, although not necessarily ideal, gives both parties a little more time to pick meaningful and measurable PBP events.

The PBP rates for the three contracts vary. The FMTV rate is 90 percent of each vehicle CLIN, the E-2C rate is 83 percent of each aircraft (deliverable item basis), and the C-17 rate varies over the life of the procurement. The C-17 contract stated that:

...it was the intent of the parties to establish the "value" of the payment events based upon reimbursement of 100% of the overall projected multi-year cost expenditures (para. f, PBP).

This clause is unique to the C-17 and is explained further in paragraph A, 3, of Chapter III.

The C-17 contract is the only contract of the three studied to have a "annual reevaluation" clause which enables the procuring contracting officer (PCO) to review the PBP schedule to "ensure that the fair value payment amounts for future payments are maintained" (para. d, PBP). This is discussed in further detail later in the chapter.

This review of the three contracts is intended to show the reader the similarities and dissimilarities between the three contracts and their use of the PBP method of contractor financing. To better illustrate the potential

impact of using PBP on a contractor's cash flow, several scenarios are presented which alter the financial picture.

#### C. CASH FLOW ANALYSIS

The fiscal year (FY) 98 E-2C production contract is used to analyze the impact of using PBP on a contractor's cash flow. The other two MDAPs are not analyzed because: (1) the procuring contracting officer (PCO) for the C-17 program would not release data because he stated that Boeing-McDonnell Douglas (BMD) considered the contract PBP matrix (attachment 10 of the contract) to be proprietary (Vangsness RE: PBP), and (2) S&S, the prime contractor for the FMTV, had not completed any PBP events as of the middle of May 1999.

Although the E-2C's PBP Schedule (Appendix C) covers 39 months, from August 1997 through October 2000, only those months where actual data was available were examined. Consequently, the cash flow analysis is limited to 21 months of data covering the period from August 1997 through April 1999. It should be noted that the figures used here differ slightly from those of the actual E-2C FY98 PBP Schedule (less than one percent) due to the quality of the copy received by fax. For the purpose of this research the difference is immaterial.

## **1. Methodology Used**

Since the PBP Schedule provides the payment amount per event, the cost of each event was calculated. This was accomplished by first determining the price of each event (cost plus profit) - payment amount divided by the PBP factor of 83 percent. Once the price for an event was calculated, determining the cost was relatively straightforward. The event price was determined by dividing the price of each event by a factor of one plus the profit rate (12 percent). The progress payment rate is 75 percent. See Appendix D, E-2C FY98 Price, Payment, and Cost Schedule.

Actual PBP data for the FY98 E-2C contract was obtained from Defense Contract Management Command (DCMC) (Guinasso FW: PBPs). Progress payments are delayed by thirty-days in the cash flow analysis, since a large business vendor is not eligible for progress payments until his costs are actually paid (Guinasso RE: MOCAS). The often used weighted average cost of capital (WACC) for an average U.S. manufacturing firm was used as the basis to discount cash flows in this section of the thesis. This rate is 10 percent.

Five alternative scenarios of what may have occurred to NG's cash flow on the FY98 E-2C contract given the above are presented. The five scenarios are as follows: (1) everything happens according to the PBP Schedule (Appendix C), (2) the contractor is able to reduce his costs by three

percent, (3) the contractor's costs increase by three percent, (4) the contractor completes the first event successfully, but three months late, and (5) what actually occurred on the program

## **2. Scenario One - Everything Goes As Planned**

In this first scenario (Figure 4.1), the assumption is that everything goes as presumed. The events are accomplished on time and the payments are subsequently made in the same month. This is a little unrealistic, since the ACO has to receive, approve and transmit the PBP payment request to Defense Finance and Accounting Service (DFAS) for payment. The dark gray area represents the financing that the contractor would receive under progress payments. The black area is the difference between progress payments and PBP. The light gray area is the difference between the contractor's actual costs and PBP.

In this example both the progress payments and the PBP track the projected costs. The net present value of the costs, progress payments and PBP discounted at ten percent are \$117.817, \$85.105, and \$109.522 respectively (dollars in millions). Thus, the use of PBP payments versus progress payments results in an improvement in the contractor's cash flow of \$24.4 million or 28.69 percent. The PBP payments in this scenario equate to a progress payment rate of 92.96 percent. This is substantially higher than the customary 75

percent progress payment, because the event payment includes a portion of the costs and profits.

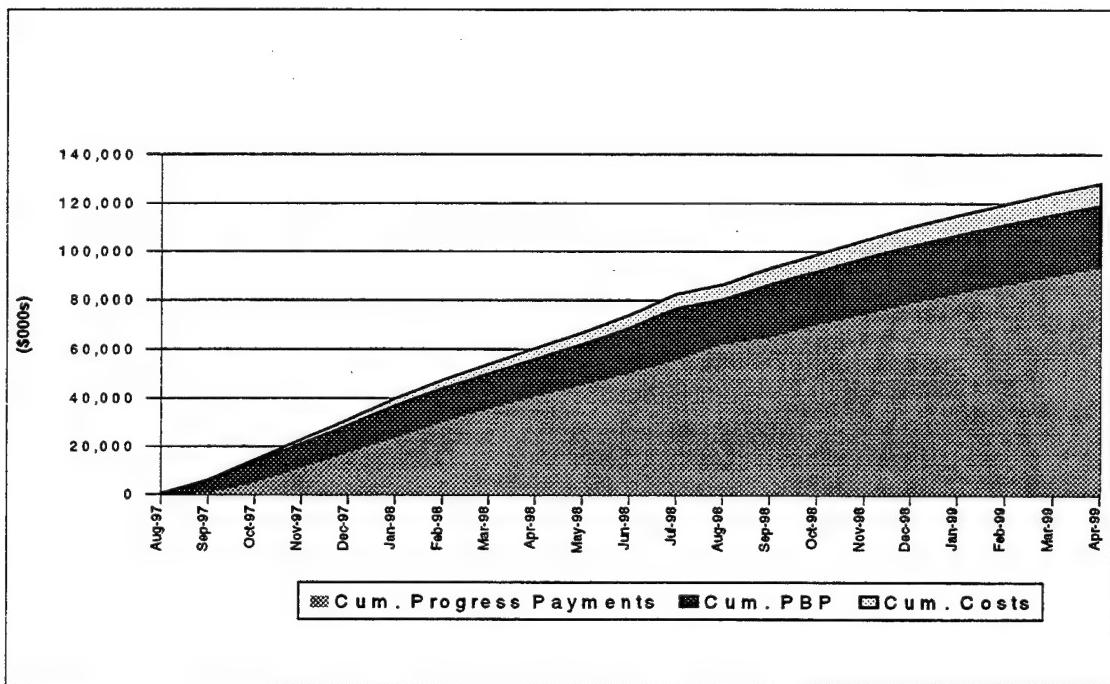


Figure 4.1: Scenario One

### 3. Scenario Two - Costs Decrease Three Percent

In this second scenario (Figure 4.2), the assumption is that actual costs are three percent less than what was anticipated when the contract was negotiated. It is highly probable during the execution of a contract that actual costs will not exactly match estimates. However, it is not very likely that a contractor will under or overrun continually his costs by an identical percent throughout the entire life of a contract.

This scenario is beneficial in that it depicts the impact of under running costs on the contractor's cash flow.

Also, it illustrates what may happen if the Government is not able to negotiate realistic PBP values and excess financing is provided. The dark gray area (lower band) represents the financing which the contractor would receive under progress payments. The black area (middle band) is the difference between the progress payments and the contractor's costs. The light gray area (top band) shows the difference between the contractor's actual costs and their proposed payment terms.

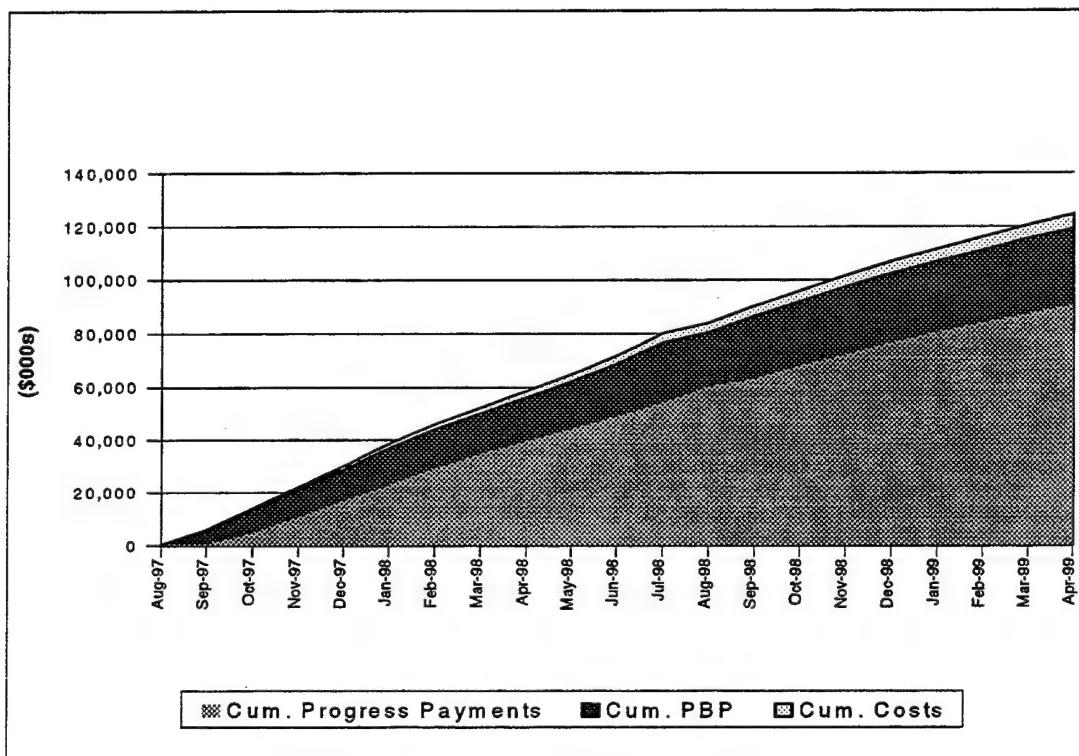


Figure 4.2 - Scenario Two

Similar to the previous scenario, both the progress payments and the PBP track the projected costs, but by differing amounts, since PBP are not based on costs

incurred. A contractor's cash flow improves as a result of using PBP versus progress payments, if either the Government is unable to determine realistic values for PBP events or the contractor is able to reduce his costs. This is one of the potential risks of using the PBP method of contractor financing.

The net present value of the costs, progress payments and PBP discounted at ten percent are \$114.282, \$82.552, and \$109.522 respectively (dollars in millions). Thus, the use of PBP versus progress payments results in an improvement in the contractor's cash flow of \$26.9 million or 32.67 percent. The PBP payments in this example equate to a progress payment rate of 95.84 percent.

The difference between the PBP and progress payments between scenarios two and one is \$2.6 million. Therefore, from the contractor's perspective he is better off by \$2.6 million dollars, if he is able to reduce his costs by three percent over the entire life of the contract.

Conversely, one might decide to look at the difference this way. As in this case, if the PBP event prices are too conservative when negotiated, then the Government must pay the interest costs on the \$2.6 million (the difference between the negotiated cost and the contractor's actual cost) in contractor financing payments.

#### 4. Scenario Three - Costs Increase Three Percent

In the third scenario (Figure 4.3), the assumption is that actual costs increase by three percent over what was anticipated when the PBP event payments were negotiated. Similar to the previous example, it is not very realistic to assume that a contractor will overrun his costs by an identical percent throughout the entire life of a contract. However, this scenario shows the impact on the contractor's cash flow of overrunning his costs. An assumption was made for this scenario that a loss ratio would be applied to progress payments. Therefore, the progress payments from scenario number one were used.

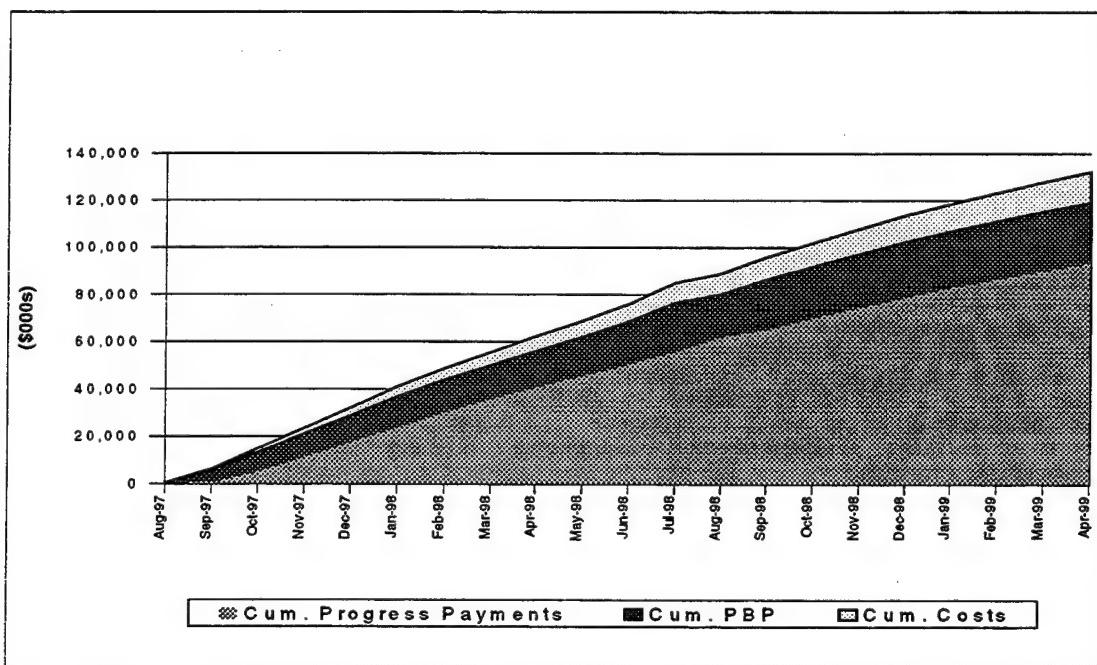


Figure 4.3 - Scenario Three

The net present value of the costs, progress payments and PBP discounted at ten percent are \$121.351, \$85.105, and \$109.522 respectively (dollars in millions). Thus, the use of PBP versus progress payments results in an improvement in the contractor's cash flow of \$24.417 million or 28.69 percent. The PBP payments equate to a progress payment rate of 90.25 percent.

Of the three hypothetical examples presented thus far, the advantage of using PBP is the smallest here. This is due to the fact that the contractor's cost increased by a net present value (NPV) of \$3.530 million over the base case (scenario one) or a NPV of \$11.829 million over scenario two.

#### **5. Scenario Four - The First Event Occurs Late**

In the fourth scenario (Figure 4.4), the assumption is that the first PBP event is not accomplished until November 1997, (three months late) and then everything tracks according to PBP Schedule (three months late). This situation shows that the contractor is bearing the risk of not successfully completing PBP events, since the Government cannot pay PBP until an event(s) is successfully completed.

If the events are cumulative, the potential impact on a contractor's cash flow can be compounded, since event completion is dependent upon the successful completion of a prior event(s). A line diagram is used in Figure 4.4

because it more clearly shows that in the early parts of this scenario, progress payments would be more advantageous to the contractor.

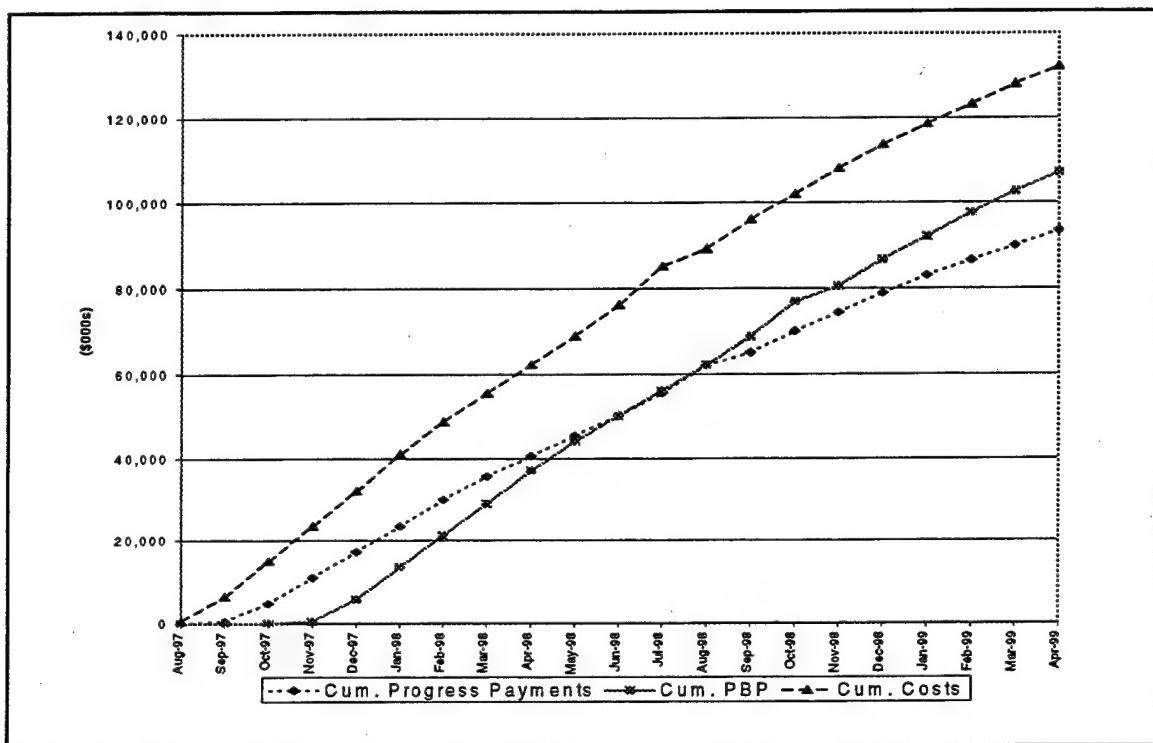


Figure 4.4 - Scenario Four

The net present value of the costs, progress payments and PBP discounted at ten percent are \$121.351, \$85.105, and \$96.675 respectively (dollars in millions). Thus, due to the three-month delay in meeting a payment event, the use of PBP versus progress payments decreased the benefit of using this method of contractor financing to \$11.570 million or 13.60 percent over progress payments.

The DoD may have concerns about the schedule delays and its potential to impact delivery. However, financing is not

a concern with PBP, because a payment cannot be made until it a PBP event is successfully completed. The PBP payments in this case equate to a progress payment rate of 79.67 percent.

#### 6. Scenario Five - What Actually Occurred

The last scenario (Figure 4.5) depicts what has actually occurred with contract financing in the FY98 E-2C contract. This scenario assumes that the contractor's actual costs correlate exactly with the costs associated with each PBP event. A DCMC representative stated that, although the MOCAS data only showed 11 payments through April, there may be multiple events within each of the payments (Guinasso 21 May).

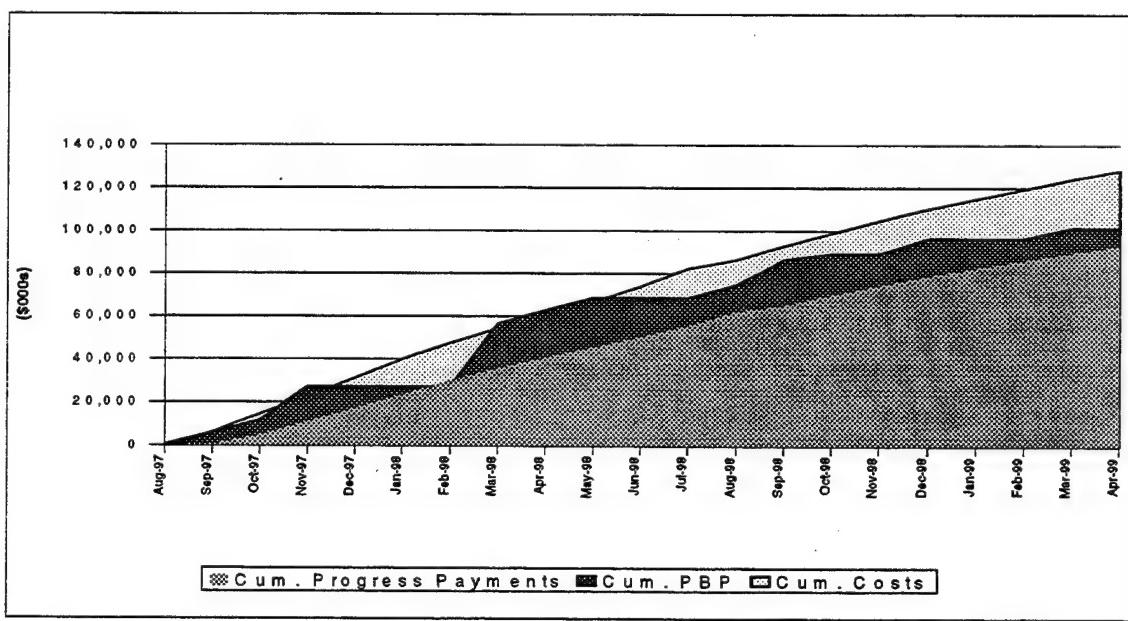


Figure 4.5 – Scenario Five

The net present value of the costs, progress payments and PBP discounted at ten percent are \$117.817, \$85.105, and

\$94.135 respectively (dollars in millions). Thus, even though PBP at times exceeded actual costs, and at other times actually fell behind what the contractor could have received if he were on progress payment, the overall benefit to the cash flow of Northrop Grumman (NG) was \$9.030 million. This represents a 10.61 percent improvement to cash flow over the use of progress payments. The PBP equate to a progress payment rate of 79.90 percent.

When cumulative PBP get ahead of cumulative costs as is depicted in Figure 4.5, there is the potential that financing is getting ahead of the value of the work. Clearly this should be avoided. Under these circumstances, the Government could be providing financing in excess of a contractor's cost incurred, thereby increasing the cost to the taxpayer.

#### **7. Summary**

The data presented above for five scenarios are summarized in Figure 4.6. The right column presents the difference between PBP and progress payments. Some general conclusions can be drawn from the five scenarios. First, PBP are more advantageous to a contractor than progress payments since they increase cash flow in all scenarios. Second a contractor's financial situation is improved if he is able to reduce his costs and is getting PBP. Third, since PBP are not paid when PBP events are not successfully

accomplished, there may be times when progress payments are more advantageous to the contractor than using PBP. This is one of the risks that a contractor incurs by using PBP. Scenario number four illustrates that in the first few months of the contract this was in fact the case.

<b>Scenario</b>	<b>Costs</b>	<b>Progress Payments</b>	<b>PBP</b>	<b>PBP less Progress Payments</b>
1. Status Quo	117.817	85.105	109.522	24.417
2. 3% Cost Decr.	114.282	82.552	109.522	26.970
3. 3% Cost Incr.	121.351	85.105	109.522	24.417
4. 3 Month Delay	121.351	85.105	96.675	11.570
5. Actual PBP	117.817	85.105	94.135	9.030

Figure 4.6 - Summary of Scenarios [\$000s]

Since PBP are a method of contract financing, they are not meant to be a bonus or incentive. PBP are intended to provide the contractor with enough money to perform the contract. An important factor when considering PBP is that they should be based on the demonstrated performance of events that lead to the completion of a contract, which is unlike progress payments that provide finance payments solely as a contractor incurs costs. PBP are only an incentive from the standpoint that this type of financing is similar to a fixed price contract. If the contractor finishes early or his costs are less than projected, then he does better financially (Guinasso 21 May).

The aforementioned scenarios as well as the interview responses from acquisition professionals associated with selected MDAPs provide insight into PBP.

#### D. INTERVIEWS

The data presented in this chapter were gathered through personal interviews of 14 acquisition professionals from various DoD activities and defense contractor organizations. The respondents include civil service personnel from the Air Force Material Command (AFMC), Naval Air Systems Command (NAVAIR), U.S. Army Tank-automotive and Armaments Command (TACOM), DCMC, Defense Finance and Accounting Service (DFAS), and the Finance, Cost and Pricing Directorate of the Office of the Under Secretary of Defense for Acquisition and Technology, Defense Procurement [OUSD(A&T)DP], as well as several different contractors including BMD, NG, and S&S. Due to limited time and travel resources, each interview was conducted by telephone. The interviews range from 15 minutes to just under one hour.

The research questions were based on the literature review conducted in Chapter II and the programs' specific information discussed in Chapter III. To facilitate the presentation of data and anonymity, the interviewees were placed into the following groups: (1) in plant DoD representatives, (2) DoD contracting offices, (3) contractors, or (4) others.

The interviews are intended to be a collection of opinions from persons experienced in the field of Defense financing and PBP. A listing of all respondents is presented in Appendix E.

1. Question One

How do you monitor PBP?

a) *In Plant Representative Responses*

**Data Presentation and Discussion:** The purpose of this question was to determine if monitoring was fairly consistent from program to program and to gain more insight than is available in the FAR. The administrative contracting officers (ACO) located in the contractors' plants were asked this question, since they are in charge of administering the contract and establishing a surveillance plan. Chapter 4.5.3 (PBP) of Defense Logistic Agency Directive 5000.4 has a relatively new requirement that the ACO shall prepare a surveillance plan for contracts with PBP. The surveillance plan for the FMTV program is contained in Appendix B.

All three respondents mentioned, or indicated in their surveillance plan, that they are very dependent upon their technical/quality assurance (QA) people to verify and document that an event has been completed. Some specific comments received are:

The QA types can certify event completion. The ACO reviews the entire package [bill submitted by

the contractor] to ensure that: (1) the appropriate QA signatures are where they are supposed to be, (2) that all backup documentation is present, and (3) to verify that the PBP event(s) have been successfully completed in accordance with the terms of the contract.

The ACO tracks the money, since he is ensuring that there is enough money in the ACRNs (Accounting Reference Numbers). Spreadsheets are used to monitor this since the ACO is certifying that money is available, and that the event has been completed. The PCO is notified of any missed events.

One of the ACOs is physically located hundreds of miles from the manufacturing site. Consequently, this ACO relies on another ACO who is located in the plant and has been delegated secondary authority to monitor PBP on his behalf. Two of the ACOs have PBP events being completed in locations other than where they are located.

#### **b) Analysis**

Although there is no regulatory requirement for a contractor using PBP to have certified systems [e.g., material management and accounting system (MMAS)], the ACOs perceive that administering PBP is much easier when one can rely on a contractor's systems for output. If a contractor has a good MMAS, then the Government can rely on the contractor for validation of PBP events. If the contractor's systems are suspect, then the ACO has to verify and convince himself that an event has actually been accomplished. This potentially requires additional time and

effort on the part of DCMC and the contractor. Further, one could summarize that this could lead to undesired friction between the Government's in-plant personnel and a contractor.

## 2. Question Two

**Does the PBP method of contractor financing reduce your administrative workload when compared to progress payments?**

**Data presentation and discussion:** The purpose of this question was to find out whether PBP require less effort to administer than progress payments. This question was asked to the "other," and "in plant representative" groups. The "in-plant" groups consists of DCMC representatives who are responsible for administering PBP and providing oversight. The "other" group, consisted of an interviewee who is responsible for supervising Government employees who make contract finance payments.

DFAS Columbus, Ohio is responsible for making payments to Defense contractors in instances where the contract administration is being performed by DCMC. Therefore, the PBP for all three MDAPs discussed in this research are paid by DFAS Columbus.

The PBP payment system is not automated like progress payments. Consequently, all PBP requests are manually processed by DFAS. As a result, the workload at DFAS is greater than it would be if using progress payments.

*a) In Plant Representatives Responses*

First, there is not an agreement among the respondents as to whether PBP increased the in plant representative's workload when compared to progress payments. When the individuals were asked about the magnitude of increase or decrease in administrative workload due to PBP, the response was mixed.

One ACO stated that when he used progress payments that he spent 12 hours per week just reviewing them. However, now he spends about one hour per week with PBP. All interviewees believe that PBP, more so than progress payments, require them to really monitor and track the expenditure of funds in order to ensure that funds are available and that the appropriate funds are used. One response included the following: "Everything has to be monitored with PBP. I feel it is a little more work [than PBP]."

*b) Other Responses*

This group is convinced that PBP require more resources to administer than progress payments. This is chiefly due to the fact that the PBP process is manual versus automated for progress payments. This group also reiterated that PBP requires them to always be on top of the funding situation. Additional comments are paraphrased below:

PBP require about twice the amount of time we spend on progress payments. The lack of automation is the principal driver in the increase in workload.

With PBP DFAS is restricted on how they can pay by contract line number (CLIN). Progress payments are different in that they are paid against the first available accounting reference number (ACRN). Thus, there is a restriction on how DFAS makes the payment.

Sometimes in MOCAS the funds are not always accurate because modifications have not been processed; therefore, DFAS has to make sure that everything is in line to make a PBP. If there are any discrepancies, DFAS has to work them out with the applicable ACO.

**c) Analysis**

This is a difficult question to quantify without being able to put a cost on the up-front efforts required to establish a contract with PBP. Once completed, this should be compared to efforts that are no longer required as a result of switching from progress payments; for example, those tasks which are no longer applicable (e.g., determining loss ratios to apply to progress payments, etc.). Like any relatively new process, as the DoD and industry use more contracts with PBP, one should be able to capitalize on the experience to improve the administrative processes associated with using PBP. A defense contractor made the following observation regarding DCMC and his firms' employees.

Our accountants are actually analyzing systems vice dealing with DCMC auditors. DCMC has been able to cut their in plant staff by almost half

largely because of the use of PBP. Moreover, I think that our relationships with the Government are more positive now.

This respondent's comments seem to imply that as a result of switching from progress payments to PBP, both industry and the Government receive tremendous tangible and intangible benefits. Additional research would be needed to verify this claim.

### **3. Question Three**

#### **How might the current PBP process be improved?**

**Data Presentation and Discussion:** This question was asked to all four groups. The purpose was intended to find out from the experts and those with "hands on" experience how the PBP method of contract financing can be enhanced. All four groups mentioned that since PBP are processed manually (i.e. not an automated payment system), that this process should be automated to expedite payment, facilitate processing in accordance with the contract, and to reduce administrative workload.

##### **a) In Plant Representative Responses**

This group mentioned relatively slow payments by DFAS as a source of frustration. One respondent said that it was not uncommon for DFAS to take up to 20 days or longer to get a PBP paid even though there are no problems encountered. Another concern expressed was that DFAS is not distributing funds in accordance with the contract (i.e.,

disbursing dollars to the appropriate ACRNS). Another comment from this group concerned training:

There should be more guidance to help the ACO. Right now I feel like I am on new and dangerous ground.

**b) DoD Contracting Office Responses**

This group made many recommendations for improving the PBP process, some of which they can directly influence. Some of their specific comments follow.

If the payment instructions in our contracts are not good, there is a high probability of the wrong items getting paid.

We [the contracting offices] can impact them [DFAS] by making sure that the payment instructions that we include in the contract are clear so that when the bills [PBP] go to DFAS they know what to do. Writing clear payment instructions is very important. DFAS must be involved in the process and be intimately familiar with the contract language contained in section G.

Moreover, one respondent believes that there are pressures for the contracting activities to use PBP and other acquisition reform initiatives in order to appear like they are embracing and willing to try new initiatives, rather than using processes that make the best business decision. Further comments follow below:

People need to first understand how they are supposed to work, and how they are going to be used. And I guess that starts with an education process...

I think we as a whole Government jumped into PBP as being the solution of the month without having the proper training and guidance on how to implement these things.

*c) DoD Contractor Responses*

This group is very concerned about the timeliness, or lack thereof, of PBP since it impacts their firms' cash flow. One respondent summed up his frustration with the payment process as follows:

As simplistic and streamlined as PBP is, it is still taking about 21 days on average to get this out of the DFAS payment office.

Others expressed concerns that a contractor can potentially be held hostage to produce additional reports, beyond those specified in the contract, to appease those verifying event completion for the Government. The contractor is not in a very strong position to argue, since tens of thousands of dollars in PBP or more can be potentially delayed.

In addition, another respondent said:

There needs to be some kind of training because there is not a very clear definition of exactly what all the stuff [PBP] means.

*d) Other Responses*

Of the three groups previously mentioned, this group is the furthest removed from the day-to-day operations of a specific contract using PBP. Rather, this group is exposed and involved in a myriad of financing, policy and other issues. Consequently, this group is able to look at PBP with a different and potentially less biased

perspective, since they are not involved in the day-to-day administration or management of PBP.

One respondent suggested that one reason DFAS is having problems with payments is because some contracting activities seem to pride themselves on writing complex contracts with a lot of ACRNs. Furthermore, he stated that automation is not the only answer to resolving the payment issues, since even the best computer programs would have a hard time figuring out some of these complex contracts. This individual added that the payment system is part of the contracting process and should not be ignored. Like any other acquisition process, he thinks that it needs to be carefully managed. Essentially his bottom line centered on the following comment: "DFAS must be a full partner in the acquisition planning stage..."

Other comments in response to this question include:

PBP are all manual payments to begin with, so that is a problem right there. DFAS doesn't have the systems to accommodate PBP in an automated fashion.

Everybody is trying to come up with a solution to a difficult problem, but it is an information technology problem that is really information management. Therefore, it is a systems problem. You can talk all you want about doing this and that, but if you don't have the systems then you are not going to fix this problem.

e) ***Analysis***

This was a highly charged question for many of the respondents. As a whole, the groups believe that there should be improvements in the current contract finance payment systems. To a lesser extent, a number of the respondents believe that additional education and training on PBP would be helpful too.

Unfortunately, the researcher has been advised that automated system improvements are at least two years out (Guinasso 7 May). Therefore, it appears to be in the best interest of all parties to ensure that DFAS, DCMC, buying offices, contractors, etc., form integrated product teams to address payment and other issues prior to the definitization of a contract using PBP. An up front investment early in the acquisition process will aide in facilitating communication and cooperation. Moreover, this interaction may produce beneficial outcomes which might not be part of the contract, but will show up in contract performance.

This is not necessarily as easy as it sounds, since it is not uncommon for buying commands, payment centers, and defense plants to be geographically separated. Consequently, it is necessary to realize the challenges from the onset and take steps to mitigate the challenges posed by this time and distance phenomenon.

As industry and the DoD obtain more experience with PBP, the availability and quality of education and training materials should increase. Currently, most of the information available on the subject consists of a limited number of briefs, what is contained in the FAR, and a few journal articles, etc. DCMC's homepage contains much of this information and is a good resource to utilize.

#### 4. Question Four

**Do you see the PBP method of contract financing being applicable towards other types of contracts?**

**Data Presentation and Discussion:** This question was directed towards the "contracting office" and "contractor" groups, since both parties are in a position to enter into contracts with each other. The reader should note that this topic is the subject of a FAR Case 98-400 which was discussed in section H of Chapter II.

##### a) ***Contracting Office Responses***

The respondents are divided on expanding the use of PBP to negotiated contracts. One individual expressed concern with how to determine a fair and reasonable price for a PBP event without obtaining cost or pricing data from the offerors. This is a concern for this person, since cost or pricing data is not required in those instances when the PCO "determines that prices agreed upon are based on adequate price competition" (FAR 15.403-1(b)). The same

section of the FAR, however, states that the PCO can ask for this information if it is necessary to determine price reasonableness.

Another respondent said that he is under the impression that progress payments may be easier for the Government to administer. In addition, he mentioned that it is difficult to change a PBP schedule every time one has to modify a contract. For these reasons he was not sure that he would be a strong proponent of expanding their use. This same individual also said that he felt that PBP gave him the ability to negotiate a slightly lower profit rate, because PBP improves a contractor's cash flow so much. Other comments:

I really think they make sense when you have an organization that knows and controls their costs.

If you don't put pretty strict guidelines on it [PBP], a company can make out and win or lose the competition based on how they structure their payment stream. This is just another factor to take into account, and it complicates the competitive source selection. It would complicate determining what the best deal is for the Government.

One of the positives of PBP is that it motivates the contractor to accomplish events [no late deliveries].

**b) Contractor Responses**

This group does not see any problem with expanding the use of PBP to fixed price negotiated contracts, as long as one could establish meaningful and measurable events.

Two respondents expressed caution that not all events lend themselves to this type of financing.

One respondent said that it would be an administrative nightmare, for instance, to come up with an event for a 500 line item spare order. The risks and administrative cost burden would not warrant using PBP in the 500 line item spare order scenario. It would be too hard to do.

Only one contractor discussed using PBP in research and development (R&D) contracts. This was seen as being a huge risk for the contractor, since PBP are predicated on understanding your manufacturing flow and expenditure curves. Other comments include:

To pick an event in the future, do a net present value analysis and develop a fair price for each event would be extremely difficult and put tremendous risk on a corporation. It does not sound like a good way to incentivize a contractor.

### **c) Analysis**

The contractors are more supportive of expanding the use of PBP more than those employed by the DoD; depending however on the contract type (i.e., not R&D). This is probably due to the fact that PBP provide a better cash flow than progress payments, and there is the possibility that the PBP will exceed a contractor's costs. In addition, the amount of Government oversight is less with PBP. Less oversight translates into cost savings for a

contractor. Industry is able to redirect resources that were once required to satisfy DoD administrative requirements (i.e., earned value management reports) to other more productive tasks within their organizations.

The contracting office groups' reluctance seems to be due to two factors. First, there is the unknown on how such an evaluation might impact a source selection. For instance, could the apparent winner of a competition end up losing because of a cash flow analysis of PBP? Second, contractors are more aware of their cash flow and processes than the DoD. Consequently, there may be concern of providing financing in excess of a contractor's actual needs. This concern equates to risk of overpayment by the DoD. If PBP exceed the value of the work, then the contractor is getting free use of taxpayer dollars. Therefore, the contractor is in essence increasing his profit.

Further, expanding the use of PBP to negotiated contracts opens the doors for others to criticize that a PCO did not properly make a fair and reasonable determination. Will the net present value calculations preformed by the PCO or the source selection evaluation board be the subject of contract disputes? These and other concerns are issues which will have to be addressed before the proposed FAR PBP streamlining case is implemented.

## 5. Question Five

What are some of the risks of using PBP?

**Data Presentation and Discussion:** One respondent expressed concern that if one did not setup PBP properly or put an "annual reevaluation" clause (like found in the C-17 contract) in a multi-year contract then the Government runs the risk of potentially being taken advantage of financially. Moreover, he stated that since a contractor is generally more aware of cash flow than the Government employees, such a clause would preclude one party from unduly benefiting at the expense of the other.

One of the contractors stressed that it is critical that both the contractor and the Government representatives know exactly what is expected of each other prior to contract award. Further concern was expressed over the power that the ACO has in administering PBP.

Once the contract has been signed, how the [PBP] process works is fairly much at the discretion of the ACO as opposed to the PCO. And in that point, the ACO can make life as complicated or as easy for you as they see fit.

One respondent from the "other" group noted that PBP are more of a "S" shaped curve rather than a diagonal straight line (see Figure 4.4). Consequently, he stated that there have been some complaints from contracting activities using PBP that the budget people have threatened to take away some of their money because they are not

spending (a.k.a. burning) it as quickly as the budget folks would like. With progress payments one is always showing expenditures as costs are incurred, but with PBP it might not look like a program is spending any money. This is due to the fact that a contractor is not paid until a PBP event is successfully completed. If a contractor misses some PBP events, then this will exacerbate the slow spending profile.

This same respondent gave an example of why it might be advantageous to request cost information when using PBP. A contracting activity added a clause to a contract requiring the contractor to provide cost reporting information. Midway through the contract it was noticed that there was a large variance between what the contractor was billing and what they were expending, to the contractor's benefit. If the contracting activity had not requested this information, then the Government officials would not have learned about the variance.

From a contractor's perspective, one respondent said that they are on the hook not only to meet the PBP schedule but also to actually perform the event in order to ensure cash flow for the corporation. This is important he said because PBP provide for an early recovery of cash throughout the lifetime of a project. An additional insightful comment includes:

If you miss an event, you don't get paid. But if you are developing [a product] with a mature

production line and are pretty confident in what you are building and how you are building it, then there shouldn't be any problem [using PBP].

**Analysis:** With PBP the idea is not to put a lot of cash in the hands of the contractor without having an equivalent amount of work completed. Furthermore, one does not want to accidentally shift a lot of risk to the Government, or on the other hand accidentally cut off a contractor's cash flow. Therefore, an "annual reevaluation" clause similar to that used in the C-17 contract appears to make a great deal of sense in a multi-year procurement.

The comments on the expenditure of funds point out that it is going to be necessary for PCOs, and or program offices, to educate the budget folks within the DOD about PBP.

#### **E. SUMMARY**

Chapter IV compares and contrasts the similarities and dissimilarities of three MDAPs, which have been the focus of this research, and their use of PBP. Further, the FY98 E-2C PBP Schedule is used as the basis for an analysis to look at the impact on the contractor's cash flow of changing costs and or adjusting the timing of PBP events. The chapter concludes with the results of interviews with 14 DoD and contractor acquisition professionals familiar with either one of the specific MDAPs, or PBP in general. The following chapter summarizes this research, draws conclusions,

supports recommendations for improvement, and suggests further areas for research.

## V. CONCLUSIONS, RECOMMENDATIONS, AND AREAS FOR ADDITIONAL RESEARCH

### A. GENERAL

Performance-based payments (PBP) offer acquisition professionals a useful contract finance vehicle. Moreover, they are preferable from the Department of Defense's (DoD) stance primarily because financing is only provided when measurable events that are stipulated in the contract are completed. From a contractor's standpoint, improved cash flow is the single most important factor for agreeing to use this method of financing. PBP represent a significant paradigm shift in the way that the DoD has historically provided financing to defense contractors. Traditionally, financing has been provided as a percentage of costs incurred performing a contract.

However, DoD and industry decision-makers must weigh the advantages and risks associated with using this method of contract financing over the other financing alternatives available. As the Family of Medium Tactical Vehicles (FMTV) contract with Stewart and Stevenson (S&S) illustrates, PBP should not be viewed as a panacea even though the Federal Acquisition Regulation (FAR) stipulates that they are the "preferred method of contract financing when the contracting officer finds them practical, and the contractor agrees to their use" (FAR 32.1001).

The primary question addressed by this thesis was: "What are the significant issues associated with the PBP method of contractor financing and how might this method be enhanced to improve its use?" To answer this question a literature review, a comparison and contrasting of three Major Defense Acquisition Programs (MDAPs) and their use of PBP, as well as a cash flow analysis, and telephone interviews were conducted.

Chapter IV began with a discussion of the similarities and dissimilarities between the three MDAPs and their use of the PBP method of contractor financing. Following this, a series of cash flow analyses were conducted to illustrate the potential impact of using PBP on a contractor's cash flow. The cash flow analysis used the Navy's and Northrop Grumman's fiscal year (FY) 1998 E-2C PBP schedule as a base line in which to conduct a series of what if analyses.

Also, Chapter IV concluded with a synopsis and analysis of telephone interviews that were designed to provide additional insights into PBP. The respondents included contractor representatives from each of the three MDAPs, Defense Contract Management Command (DCMC) representatives located at each of three contractor's plants, as well as other PBP experts and acquisition personnel familiar with PBP. The interview questions focused on five key areas, some of which addressed the primary research question and

others which addressed the secondary questions. The five key areas investigated by the research were:

1. The extent of commonality associated with monitoring PBP.
2. The degree to which PBP either decrease or increase one's administrative efforts.
3. Recommendations for improving the PBP process.
4. The applicability of expanding the PBP method of contractor financing beyond sole source fixed-price contracts for non-commercial purchases.
5. The risks associated with using PBP.

Based on the examination of the above key areas of this research, as well as the similarities and dissimilarities of the MDAPs and cash flow analyses, the purpose of this chapter is to outline the critical issues associated with PBP and discuss how this method of contract financing may be enhanced in order to improve its use. The following conclusions and recommendations are derived from the research for this thesis.

#### **B. CONCLUSIONS**

The literature review and telephone interviews revealed several challenges that potentially hamper the use of PBP by the DoD's buying commands and contractors. There was universal agreement among the survey respondents that there are definitely opportunities to improve PBP. The first conclusion of this study is:

### **1. Regulation Limits the Use of PBP**

The FAR currently limits the use of PBP to sole-source, fixed-price contracts for non-commercial purchases. Section H of Chapter III discusses that the FAR might be changed pending the review of FAR Case 98-400. Based on the interviews conducted, industry appears to be very supportive of the FAR PBP streamlining case. This support is due largely to the fact that PBP provided for an earlier recovery of cash than progress payments, and is a less obtrusive method of contract financing.

The DoD representatives have mixed opinions regarding the expansion of PBP to competitively negotiated contracts. Their concerns were how should PBP be incorporated into the evaluation process, the nature of the PBP evaluation process, and concerns about whether procuring contracting officers (PCO) will be second-guessed on their decisions.

### **2. PBP Education and Training is Insufficient**

Since PBP are a relatively new alternative method of contractor financing, there is not a large amount of training materials available to assist DoD acquisition professionals and contractors contemplating their use. Without fully understanding all of the ramifications associated with using PBP, one might enter into a contract with less than a full appreciation for what the PBP process entails. Conversely, there may be instances where contracts

lend themselves to PBP, but the buying activity and or the contractor decide not to try PBP because they feel uncomfortable with the notion.

In other instances people are reluctant to try PBP, because they are happy with and understand progress payments. If the PBP method of contract financing is expanded to include negotiated contracts and or research and development (R&D) contracts, then there will be a greater need to provide education and training materials for acquisition professionals.

### **3. The Payment End of PBP Needs to be Improved**

All of the respondents indicated that the payment end of PBP needs improvement. The Defense Finance and Accounting Service (DFAS) received the bulk of the criticism. Complications with PBP can adversely impact a contractor's cash flow, plus require a lot of administrative effort on many parties' efforts if the payments are not posted in accordance with the contract. Lack of automated payment systems for PBP was seen as being the number one contributor to this barrier.

### **4. PBP Appear to Facilitate Timely Deliveries**

In the case of the two aviation programs, the DoD acquisition officials stated that the contracts were on schedule. As one contractor stated in Chapter IV, there is a lot of pressure to meet the PBP schedule in order to

ensure cash flow for the corporation. Not meeting this schedule can result in unwanted attention from corporate officials higher in the corporate hierarchy. Thus, PBP appear to actually help promote timely delivery, since to do otherwise adversely impacts a contractor's cash flow.

**5. PBP are not Suited for All Fixed-Price, Sole Source Noncommercial Procurements**

Determining clear discernable value-added steps that contribute to the completion of a contract may not always be possible or practical. Time will tell whether this is the case for the Army's FMTV contract with S&S. The DoD and S&S may need to further define what constitutes successful completion of PBP events.

The Contracts Manager for S&S said that to try and tie PBP to the assembly points of the truck was not very appropriate, because there are 25 stations along the production line. He further stated that the flow of any given truck across the assembly points could be accomplished within an eight-hour period. It takes about nine months to complete a truck (to get all the parts in and assemble the truck); consequently, to try to take performance points here would not be too appropriate. Thus, S&S identified where in the process they needed cash infusion and tried to find performance points that would support this (Loomis).

**6. When There is a Mature Production Line and a Contractor has Confidence in his Systems and Processes,**

**then PBP are Definitely More Advantageous Financially Than Progress Payments**

Having a mature production line and dependable systems/processes greatly reduce a contractor's risk. Given such a situation, it is in a contractor's best interest financially to use PBP, since the rate applied includes a portion of the profit too. This higher rate results in improved cash flow for the contractor. See section C of Chapter IV for additional information.

**C. RECOMMENDATIONS**

The following recommendations are designed to ensure that the Government is providing the right level of contract financing, and to improve industry and acquisition professionals' understanding of PBP. There is not a recommendation for addressing the conclusion regarding that regulation limits the use of PBP, because this topic is currently the subject of an outstanding FAR Case."

**1. Additional Education and Training Materials Need to be Developed**

Defense Contract Management Command (DCMC) seems to be the best repository of online information on PBP. As additional information is developed, it should be included on DCMC's web site as an example for others to use. For example, putting a copy of an administrative contracting officer's (ACOs) PBP Surveillance Plan would be helpful for those ACOs who may have to prepare such a plan.

PCOs/ACOs should also be very familiar with conducting net present value evaluations. This will become especially important if PBP use is expanded to include competitive negotiated contracts.

Procuring Contracting Officers (PCOs) as well as ACOs should be encouraged to share their lessons learned. Such information should be consolidated, posted on DCMC's Homepage and incorporated into the Defense Acquisition Deskbook. This seems to be a worthwhile undertaking to facilitate the sharing of ideas and information across service lines. The "annual reevaluation" clause in the C-17 multiyear contract is an example of PBP information that should be disseminated.

**2. Multiyear Procurements Using PBP Should Contain an "Annual Reevaluation" Clause Similar to that Used in the C-17 Contract**

Typically, accuracy of cost estimates decreases as the amount of time increases. This is due to the fact that it is difficult to project costs out four plus years, and that the contractor is gaining experience as the number of units increases. Consequently, it seems prudent to include such a clause in a contract to ensure that one party is not benefiting at the expense of the other. The C-17 clause is discussed in section A of Chapter III.

If a contract containing PBP does not contain a similar clause, it would be virtually impossible to renegotiate

future PBP events unless both parties agreed to do it. As a result, one party could be benefiting at the expense of the other.

**3. PCOs Should Consider Requesting Cost Reporting Information for Contracts that Use PBP**

This seems like a prudent thing to consider for at least the first production run, because without it the Government will not learn what the difference is between projected and actual costs. This information provides insight into a contractor's costs and will be helpful in negotiating future production buys. Moreover, the information may point out problems with a contractor's estimating system.

However, this may also be perceived by contractors as an intrusion into their operations or as a lack of trust by the Government. Therefore, PCOs should carefully weigh the benefits and disadvantages associated with requesting cost reporting information. If required, contractors may elect to use progress payments or not pursue Government business. Furthermore, a requirement to provide cost reporting information may cause non-traditional defense contractors not to consider pursuing DoD contracts.

**4. Improve the PBP Disbursement and Accounting Process**

The evidence gathered in the telephone interviews signified that this is a problem area that needs to be

improved. Fielding new payments systems more quickly will help, but will not completely solve the payment process. Other recommendations for enhancing this process are as follows:

- a) **Incorporate DFAS and DCMC into MDAP Integrated Product Teams (IPTs):** As a telephone respondent said, one should treat the payment process like one would any other part of the acquisition process. One should make these two agencies part of the solution, not part of the problem. This is especially critical until the new automated payment system becomes operational.
- b) **Write less complex contracts:** The more complex the contract the more difficult it is to administer, get them paid on time, close them out, etc. Part of this step entails that the PCOs write clear concise payment instructions.
- c) **Hold periodic face-to-face meetings if necessary:** One respondent remarked that it is amazing how much face-to-face "grip and grin" sessions can improve things. An ACO who is administering PBP may be well served by following this advice and meeting periodically with his DFAS representatives to discuss issues and resolve problems after contract award.

#### **5. When Practical and Feasible, Defense Contractors Should Push for PBP Versus Progress Payments**

The cash flow scenarios in Chapter IV, showed that PBP greatly enhance a contractor's cash flow anywhere from 10.6 percent to 36.9 percent over progress payments. This is due to the fact that the PBP is greater than progress payments, and includes a portion of the profit too. Although there

are risks associated with using PBP (i.e., cost overruns and missed payment events), these benefits warrant serious consideration. Not only is cash flow improved, but there is also potentially less oversight from the Government.

This is analogous to having the choice of using either straight-line or double-declining balance for depreciation and tax reporting. Clearly the later is preferable, because of the time value of money. One can reduce his tax liability using this method. Similarly, PBP provide for an earlier recovery of cash and result in a higher net present value when compared to progress payments.

**6. Contractors and Buying Commands Considering PBP  
Should First Look Closely at the Maturity of the  
Product, Stability of Design, the Length and Steps in  
the Production Cycle, and the Contractor's Systems**

Since PBP can only (currently) be used on definitized, sole-source, fixed-price contracts for noncommercial items, it does not make sense to consider using this method of contract financing if a lot of contract modifications are possible. If a contract modification is anything other than administrative in nature, then it is possible that either the entire or parts of the PBP schedule will have to be modified. Given the difficulty of coming up with the events and determining the prices in the first place, this should be avoided if at all possible.

The length and steps in the production cycle/process are important considerations, because the PBP bases must be

clearly established. Further, the completion of an event or criterion should contribute to the ultimate completion of the contract. Finally, as previously discussed, PBP are much easier to implement if the Government can rely on the output of a contractor's systems.

**D. SUMMARY OF RESEARCH QUESTIONS**

In order to accomplish the objectives of this study, the following questions were developed and investigated:

**1. Primary Research Question. What are the Significant Issues Associated with the PBP Method of Contractor Financing and How Might this Method be Enhanced to Improve its Use?**

The significant issues associated with PBP are the following:

a) **PBP entail accepting more risk.**

Determining meaningful PBP criteria/payment events requires a thorough knowledge of a contractor's products and processes. If not implemented correctly the Government could end up providing either excess or not enough financing to support a contractor's actual requirements. A contractor's incentives for using this method of financing are improved cash flow and less Government oversight.

b) **PBP events must be clearly understood.** As the FMTV contract illustrates, the ACO is not going to authorize a PBP event if there is any question as to whether or not an event has been accomplished. Therefore, it is critical that the Government and contractor have a mutual understanding of what constitutes successful completion of a PBP event.

This method of financing can be enhanced in several ways. First, PBP can be improved by ensuring that those contemplating using this method of contract financing have access to educational and/or training materials to guide them through the PBP process and help them avoid potential pitfalls. Second, the stakeholders of a contract need to work together to ensure that the payment and processing of PBP are integral part of the acquisition process.

**2. Secondary Research Question #1. What are PBP?**

The literature review conducted in Chapter II revealed that PBP are contract financing payments for non-commercial items which are made on the basis of:

- performance measure by objective, quantifiable methods;

- accomplishment of defined events; or
- other quantifiable measures or results.

**3. Secondary research question #2. How are PBP  
Currently being Utilized?**

PBP are generally used on large MDAPs with the aerospace industry (i.e. C-17, B-2, F-16, E-2C and Apache Longbow).

**4. Secondary Research Question #3. What are the  
Critical Issues and Problems Associated with PBP?**

The respondents indicated that there are essentially two issues and problems associated with PBP. They were problems associated with the payment of PBP; and the lack of education and training materials on this subject to support DoD acquisition professionals and contractors.

**5. Secondary Research Question #4. How Does Private  
Industry and the DoD View PBP?**

The majority of the contractor respondents liked PBP because it provides for better cash flow than the alternative, progress payments based on costs. However, this group also expressed some concerns such as frustration over what constitutes event completion, slow payments, etc. The majority of the DoD respondents thought PBP were a good thing. However, a majority of these respondents mentioned

frustration with DFAS and the fact that PBP require more effort up front to negotiate than contracts having progress payments.

**6. Secondary Research Question #5. What is the Nature of the PBP Evaluation Process?**

The nature of the evaluation process is to ensure that the contractor has adequate cash flow, that there is the proper level of motivation for the contractor, and that achieving the payment event will lead to successful contract completion. This requires one to be familiar with a contractor's products and processes, because PBP are based on measurable performance through defined events (a.k.a. milestones).

**7. Secondary Research Question #6. How does the Government Monitor PBP?**

DCMC is responsible for administering payments under PBP contracts. The ACOs are responsible for developing a surveillance plan identifying how performance criteria or events will be monitored. The DoD in-plant quality assurance (QA) and technical personnel assist the ACO in monitoring PBP. Ideally a contractor's systems are certified and the ACO and technical/QA personnel feel comfortable with the reports generated. They can rely on this information to certify event completion.

**8. Secondary Research Question #7. What will a  
Financial Analysis of Actual PBP Suggest when Compared to  
Progress Payments Based on Costs?**

Since the payment rates are applied to a percentage of price (cost plus profit) versus a percentage of costs incurred (progress payment), PBP are generally more advantageous to a contractor than progress payments. Consequently, this method of contract financing improves a contractor's cash flow. In the scenarios presented in Chapter IV, the use of PBP resulted in an improvement in cash flow from anywhere from 10.6 percent to 36.9 percent over progress payments.

**9. Secondary Research Question #8. How Might the PBP  
Process be Improved and Utilized in Other Contracts?**

This is the focus of a FAR Case that is discussed in section H of Chapter II. The contractor respondents seemed to believe that expanding PBP to competitively negotiated contracts would not be very difficult to accomplish and would be worthwhile to pursue. Most of the acquisition professionals within the DoD and the contractors were not certain that expanding PBP into R&D type contracts would be advantageous given the inherent risks associated with this type of procurement.

#### **E. AREAS FOR ADDITIONAL RESEARCH**

The following are recommended topics for further research:

- 1.** Research the level of accuracy of contracts' PBP schedule costs. Analyze the cash flows of the contracts and compare this to actual costs (would need cost reporting information from the contractor).
- 2.** Research and analyze the delivery profiles of contracts using PBP payments. Determine whether PBP are motivating contractors to keep up with the production schedules better than progress payments would have.
- 3.** Determine methods not analyzed in this thesis to promote more PBP participation by buying commands and defense contractors.
- 4.** Quantify the additional costs of using PBP versus progress payments based on costs.



## **APPENDIX A**

### **PERFORMANCE-BASED PAYMENTS SURVEILLANCE PLAN**

**Stewart & Stevenson Services, Inc.**

**Tactical Vehicle Systems Division**

**May 12, 1999**

1. This Surveillance Plan is being written in accordance with DLAD 5000.4, Chapter 4.5.3. Performance Based Payments (PBP), FAR 52.232-32, 32.1007 to provide guidance and ensure that each team member understands their own role, as well as, the roles and responsibilities of the other team members.
2. The ACO's assessment risk to the Government has been determined to be high because Prepayment Reviews, Post Payment Reviews and Periodic reviews are required. Prepayment Reviews shall be conducted as required. Periodic and Post Reviews shall be conducted quarterly. The reviews shall be conducted as long as the contractor is actively billing performance based payments. The following areas shall be included in the review:
  - a. Does the contractor have adequate controls for the administration of performance-based billings?
  - b. Are the outstanding performance based payments capable of being liquidated?
  - c. Is the contractor's financial condition sufficient to finance its current contractual workload to completion and to liquidate outstanding performance-based payments?
  - d. Is the contractor's progress on the contract commensurate with performance based billing payments?
  - e. Has the contractor submitted supporting documentation for DCMC to verify the performance events?
3. Performance-based payments may be made on any of the following bases:
  - a. Performance measured by objective, quantifiable methods;
  - b. Accomplishment of defined events;
  - c. Other quantifiable measures of results.

4. The Contractor's performance-based payment request can not be approved until the specified event or performance criterion has been successfully accomplished in accordance with the contract.
5. Total performance-based payments shall not exceed 90 percent of the contract price if on a whole contract basis, or 90 percent of the delivery item price if on a delivery item basis.
6. The contractor shall submit performance-based billing procedures to the Contracting Officer prior to requesting payment. The contractor may submit requests for payment of performance-based payments not more frequently than monthly in a form and manner acceptable to the Contracting Officer. All performance-based payments in any period for which payment is being requested shall be included in a single request, appropriately itemized and totaled. The Contractor's request shall contain the following:
  - a. The contractor shall submit performance-based billing procedures to the Contracting Officer prior to requesting payment.
  - b. The Contractor's PBP request shall contain the following:
    - (1) The name and address of the Contractor;
    - (2) The date of the request for performance-based payment;
    - (3) The contract number and contract line item under which the request is made.
    - (4) Supporting documentation that shall substantiate the successful performance of any event or performance criterion which has been or is represented as being payable.
    - (5) Appropriation account information for distribution of financing payments to the respective funds accounts to ensure ACRN integrity.
    - (6) A certification by a Contractor official authorized to bind the Contractor as specified in FAR52.232(m).
  - c. The contract should only request payment for items that are in accordance with contract requirements.
7. Upon receipt of the performance-based payment, the Contracting Officer/Contract Administrator/Specialist shall ensure copies are provided to a copy to the Operations Technical Team Leader and the TAG Team Leader. The Operations and TAG Team

Leaders shall ensure that copies are provided to the applicable technical specialist on the team ( i.e. Engineer, Industrial Specialist, Quality Assurance Specialist)

8. The Technical Assessment Group (TAG) Industrial Specialist and Team Leader shall perform the following:

a. Develop procedures for the technical review process, such as sampling size, records to be reviewed, etc.

b. Review the performance-based payment, supporting documentation, contractor's records and system to determine the following:

(1) Is the contractor's progress on the contract commensurate with performance based billing payments?

(2) Has the contractor successfully completed the performance of all events or performance criterion represented as being payable in accordance with the contract.

c. Perform a monthly review of the proposed date for receipt of parts to the actual receipt date of the parts.

d. Obtain the recommendation from the TAG engineer on the approved waivers and deviations.

e. Coordinate issues with the contractor. Provide a summary of the review and a recommendation in writing to the Contracting Officer. If there are issues, the recommendation should include the contractor's comments either by incorporation or by attachment.

9. The Technical Assessment Group (TAG) Engineer and Team Leader shall perform the following:

a. Review the performance-based payment to ensure that there are no material purchases or services that are for waivers, deviations, engineering change proposals that have not been approved for the contract in which the performance-based billing is applicable.

b. Coordinate issues with the contractor. Provide a summary of the review and a recommendation in writing to the TAG IS and the Contracting Officer. If there are issues the recommendation should include the contractor's comments either by incorporation or by attachment.

10. The Operations Quality Assurance Specialist and Team Leader shall perform the following:

a. Develop procedures for the technical review process, such as sampling size, records to be reviewed, etc.

b. Review the performance-based payment, supporting documentation, contractor's records and system to determine the following:

(1) Has the contractor successfully completed the performance of all events or performance criterion represented as being payable in accordance with the contract.

c. Coordinate issues with the contractor. Provide a summary of the review and a recommendation in writing to the Contracting Officer. If there are issues, the recommendation should include the contractor's comments either by incorporation or by attachment.

11. The Operations Industrial Specialist and Team Leader shall perform the following:

a. Develop procedures for the technical review process, such as sampling size, records to be reviewed, etc.

b. Review the performance-based payment, supporting documentation, contractor's records and system to determine the following:

(1) Has the contractor successfully completed the performance of all events or performance criterion represented as being payable in accordance with the contract.

(2) Is the contractor meeting the contract schedule. Review the contract delivery schedule and MPS and the contractor's actual performance.

c. Coordinate issues with the contractor. Provide a summary of the review and a recommendation in writing to the Contracting Officer. If there are issues, the recommendation should include the contractor's comments either by incorporation or by attachment.

12. The TAG Chief and Team Leader for Quality Assurance, Industrial Specialist and Engineer should

a. Ensure compliance with established procedures

- b. Review the QA, IS, ENG recommendation ensure data accuracy before submittal to ACO.
    - c. Ensure an alternate person is appointed to serve as backup in the absence of the primary reviewer. Train the alternate person as required.
- 13. The Operations Chief and Team Leader for Quality Assurance and Industrial Specialist should ensure
  - a. Ensure compliance with established procedures
  - b. Review the QA, IS recommendation ensure data accuracy before submittal to ACO.
  - c. Ensure an alternate person is appointed to serve as backup in the absence of the primary reviewer. Train the alternate person as required.
- 14. The Contract Administrator or Specialist shall perform the following:
  - a. Review the performance-based payment to determine the following:
    - (1) Is the PBP in accordance with the terms and conditions of the contract and FAR and DFAR regulations.
    - (2) Has funding been provided for the payment.
    - (3) Is the information in MOCAS in accordance with the contract? The CA/CS shall review MOCAS to determine database integrity. The accounting appropriation on the PBP should correspond with the information in the contract and in MOCAS. Place a copy of the MOCAS printout in payment folder.
  - b. Update the PBP log to reflect the current request.
  - c. Review the information provided by the Industrial Specialist, Engineer, Quality Assurance Specialist and coordinate and clarify issues if required.
  - d. Review MOCAS or REVEAL to obtain actual payment date and amount. Update PBP log to reflect actual payment information. Ensure that DFAS paid from the right ACRN. Place a copy of the payment notice in payment folder.
  - e. Coordinate with DFAS as required.

- f. Coordinate with DCMC technical specialists.
  - g. Coordinate issues with the contractor. Provide a summary of the review and a recommendation in writing to the Contracting Officer. If there are issues, the recommendation should include the contractor's comments either by incorporation or by attachment.
15. The Financial Analyst's review(s) shall encompass the contractor's financial position, title issues, and any other areas that may impact performance-based payments.
16. DCAA review shall determine if the Contractor has adequate controls for the administration of performance-based billings.
17. The Administrative Contracting officer shall perform the following:
- a. Coordinate with the Contractor to determine the appropriate format and supporting documentation required.
  - b. Review PBP in accordance with FAR and contract requirements.
  - c. Ensure that the PBP certification is received.
  - d. Obtain written recommendation from Technical Specialist when determining approval or disapproval of PBP.
  - e. Coordinate with DCAA to ensure contractor has adequate controls for the administration of performance-based payments.
  - f. Coordinate with the Financial Analyst to obtain the Contractor's financial condition.
  - g. Ensure ACRN integrity and ensure appropriate logs are updated.
  - h. Keep the PI, PCO and PMO informed of significant issues, such as reduction or suspension of PBPs.
  - i. Ensure the PBP is reviewed and approved in a timely manner.
18. The Operations Chief for the ACO and Team Leader for Contract Administrators/Specialists should ensure compliance with established procedures.
19. See Attachment 1 – Surveillance Plan by PBP Event for further details.

20. The cognizant DCMC Stewart & Stevenson - Sealy ACO will be the focal point for the Surveillance team.

**DATE: May 12, 1999**  
**CATHY BAKER**

**Administrative Contracting  
Officer**

**PERFORMANCE-BASED PAYMENTS SURVEILLANCE PLAN  
BY PBP EVENTS**  
**Stewart & Stevenson Services, Inc.**  
**Tactical Vehicle Systems Division**

A. <u>EVENT</u>	<u>BILLING PERCENTAGE</u>
1. EVENT 0001	10% of CLIN Price
2. EVENT 0002	10% of CLIN Price
3. EVENT 0003	60% of CLIN Price
4. EVENT 0004	<u>10% of CLIN Price</u>
<b>TOTAL</b>	<b>90% of CLIN Price</b>

**B. EVENT CRITERIA**

**1. EVENT 0001**

a. Criteria –

(1) This event is based on the planning, qualification, selection and placement of purchase orders to support the procurement of long lead and common component materials to support the Master Production Schedule (MPS) planned build of each vehicle through Station 18/19.

(2) This event occurs six months prior to each Station 18/19 planned build.

(3) This event is performance-billed at 10% of each vehicle CLIN price.

(4) This event is severable from all other events and can be billed at the time the event is completed without regard to completion of any other event. However, billings shall not exceed the planned monthly build through Station 18/19.

b. Contractor -

(1) The Contractor will supply the Administrative Contracting Officer (ACO) with documentation verifying orders placed as evidenced by the Material Requirements Plan (MRP) Report identified in the Performance Payment Billing Procedures as follow:

- (a) Invoice and Certification
- (b) Certification of Long Lead Items
- (c) 6-Month Purchase Order (P.O.) Status Report
- (d) 6-Month Purchase Order Status Report – Exceptions Only
- (e) Current Production Schedule

c. Technical Assessment Group (TAG) Industrial Specialist (IS)

The IS shall review the performance-based payment, supporting documentation, contractor's records and system in accordance with the review procedures established (i.e. review purchase orders) to determine the following:

- (1) Is the contractor's progress on the contract commensurate with performance based billing payments?
- (2) Has the contractor successfully completed the performance of all events or performance criterion represented as being payable in accordance with the contract.
- (3) Provide a summary of the review and a recommendation in writing to the Contracting officer.

d. Contract Administrator/Specialist

The Contract Administrator/Specialist shall review the PBP in accordance with the established review procedures.

e. Administrative Contracting Officer (ACO)

The ACO shall review the PBP in accordance with the established review procedures and approve or disapprove.

**2. EVENT 0002**

a. Criteria -

(1) This event is based on the pre-production labor necessary to support each planned vehicle build. i.e., ME/IE, E-coat, and BII kit assembly.

(2) This event occurs three months prior to each Station 18/19 planned build.

(3) This event is performance-billed at 10% of each vehicle CLIN price.

(4) This event is severable from all other events and can be billed at the time the event is completed without regard to completion of any other event. However, billings shall not exceed the planned monthly build through Station 18/19.

b. Contractor -

(1) The Contractor will supply the Administrative Contracting Officer (ACO) with documentation of evidence of the Contractor's ability to plan, organize and manage all pre-production activities – labor and material - in order to effect a smooth transition from parts procurement to vehicle acceptance by the Government as evidenced by MRP Report identified in the Performance Payment Billing Procedures as follow:

(a) Invoice and Certification

(b) Certification of Master Production Schedule

(c) Minutes of formal MPS Planning Meeting

(d) Current Master Production Schedule

c. Technical Assessment Group (TAG) Industrial Specialist (IS)

The IS shall review the performance-based payment, supporting documentation, contractor's records and system in accordance with the review procedures established. (i.e. review of work instructions for purchasing)

- (1) Is the contractor's progress on the contract commensurate with performance based billing payments?
- (2) Has the contractor successfully completed the performance of all events or performance criterion represented as being payable in accordance with the contract.
- (3) Provide a summary of the review and a recommendation in writing to the Contracting officer.

d. Operations (Ops) Industrial Specialist (IS)

The (OPs) IS shall review the performance-based payment, supporting documentation, contractor's records and systems in accordance with review procedures. (i.e. review capability of manning- touch labor and ME, IE- and equipment)

- (1) Has the contractor successfully completed the performance of all events or performance criterion represented as being payable in accordance with the contract.
- (2) Provide a summary of the review and a recommendation in writing to the Contracting officer.

e. Operations (Ops) Quality Assurance (QA)

The OPs QA shall review the performance-based payment, supporting documentation, contractor's records and systems in accordance with review procedures. (i.e. review of manufacturing work instructions)

- (1) Has the contractor successfully completed the performance of all events or performance criterion represented as being payable in accordance with the contract.
- (2) Provide a summary of the review and a recommendation in writing to the Contracting officer.

f. Contract Administrator/Specialist

The Contract Administrator/Specialist shall review the PBP in accordance with the established review procedures.

g. Administrative Contracting Officer (ACO)

The ACO shall review the PBP in accordance with the established review procedures and approve or disapprove.

**3. EVENT 0003**

a. Criteria -

(1) This event is based on material receipt 60 days in advance of Station 18/19 planned build for each vehicle or materials that have been scheduled in, not received, but committed to the extent that termination liability would be 100%.

(2) This event occurs two months prior to each Station 18/19 planned build.

(3) This event is performance-billed at 10% of each vehicle CLIN price.

(4) This event is cumulative and cannot be billed until events 0001 and 0002 are complete. However billings shall not exceed the planned monthly build through Station 18/19.

b. Contractor -

(1) The Contractor will supply the Administrative Contracting Officer (ACO) with documentation of evidence of the continued receipt of materials to support the build of vehicle through Station 18/19. This event occurs 60 days to planned Station 18 build and will be verified by the Contractor's material receiving report which will reflect either receipt of material or commitment to be received prior to Station 18 build as evidenced by MRP Report identified in the Performance Payment Billing Procedures. This event will be performance-billed at 60% of each vehicle CLIN price. The contractor will provide the following:

(a) Invoice and Certification

(b) Certification of Long Lead Items

(c) 2-Month Purchase Order (P.O.) Status Report

(d) 2-Month Purchase Order Status Report – Exceptions Only

(e) Current Production Schedule

(a) Purchase Order (P.O.) Status report which will include all orders. The report shall specify the requirements for the production and spares.

(b) Purchase Order Status report for exceptions. The report shall specify the exceptions for production and spares.

c. Technical Assessment Group (TAG) Industrial Specialist (IS)

The IS shall review the performance-based payment, supporting documentation, contractor's records and system in accordance with the review procedures established (i.e. review purchase orders) to determine the following:

(1) Is the contractor's progress on the contract commensurate with performance based billing payments?

(2) Has the contractor successfully completed the performance of all events or performance criterion represented as being payable in accordance with the contract.

(3) Provide a summary of the review and a recommendation in writing to the Contracting officer.

d. Contract Administrator/Specialist

The Contract Administrator/Specialist shall review the PBP in accordance with the established review procedures.

e. Administrative Contracting Officer (ACO)

The ACO shall review the PBP in accordance with the established review procedures and approve or disapprove.

#### **4. EVENT 0004**

a. Criteria –

- (1) This event is based on each Station 18/19 actual build completion
- (2) This event is performance-billed at 10% of each vehicle CLIN price.
- (3) This event is cumulative and cannot be billed until events 0001 and 0003 are complete. However billings shall not exceed the planned monthly build through Station 18/19.

b. Contractor -

(1) The Contractor will supply the Administrative Contracting Officer (ACO) with documentation of evidence of the completion of 95% (or more) for PY 1 and PY 2 and 98% (or more) of the Bill of Material based on Station 18/19 actual build. This will be evidenced by the following:

- (a) Invoice and Certification
- (b) Certification of Substantial Completion and Dyno Test Completion
- (c) Open Allocation Schedule with Substantial Completion Calculation
- (d) Costed BOM Summary

c. Operations (Ops) Quality Assurance (QA)

The OPs QA shall review the performance-based payment, supporting documentation, contractor's records and systems in accordance with review procedures. (i.e. review of dynamometer completion, Vehicle Inspection Record)

- (1) Has the contractor successfully completed the performance of all events or performance criterion represented as being payable in accordance with the contract.
- (2) Provide a summary of the review and a recommendation in writing to the Contracting officer.

d. Operations (Ops) Industrial Specialist (IS)

The (OPs) IS shall review the performance-based payment, supporting documentation, contractor's records and systems in accordance with review procedures. (i.e. review of Backflush report – parts installed and missing parts)

- (1) Has the contractor successfully completed the performance of all events or performance criterion represented as being payable in accordance with the contract.
- (2) Provide a summary of the review and a recommendation in writing to the Contracting officer.

e. Contract Administrator/Specialist

The Contract Administrator/Specialist shall review the PBP in accordance with the established review procedures.

f. Administrative Contracting Officer (ACO)

The ACO shall review the PBP in accordance with the established review procedures and approve or disapprove.

CONTRACT NO: \_\_\_\_\_

PERFORMANCE-BASED BILLING (PBP) NO: \_\_\_\_\_

DATE OF PBP: \_\_\_\_\_

DATE PBP RECEIVED BY REVIEWER: \_\_\_\_\_

DATE PBP RECOMMENDATION PROVIDED TO ACO: \_\_\_\_\_

RECOMMENDATION: (Summarize review process and recommendation rationale)

RECOMMEND PAYMENT AMOUNT AS REQUESTED: (Yes or No)  
\_\_\_\_\_

RECOMMEND DIFFERENT PAYMENT AMOUNT: (Yes or No)  
\_\_\_\_\_

NAME: \_\_\_\_\_

DATE: \_\_\_\_\_

TITLE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

TEAM LEADER OR CHIEF SIGNATURE: \_\_\_\_\_

## **APPENDIX B**

### **Malcolm Baldrige National Quality Award 1998 Winner**

#### **Boeing Airlift and Tanker Programs**

Boeing Airlift and Tanker (A&T) Programs designs, develops, and produces the C-17 Globemaster III airlifter. Capable of carrying a 170,000-pound load, these aircraft are used by the U.S. Air Force, the company's primary customer, to transport large, heavy cargo to sites around the world. A&T is the dominant supplier in the military market for heavy-lift aircraft, and it is the sole U.S. competitor in the emerging global commercial market. A&T also supplies parts and services for transport aircraft and in-flight refueling tankers. Sales in 1997 exceeded \$2 billion.

A&T is part of the Aircraft and Missile Systems Group, the St. Louis-based segment of The Boeing Company. In addition to building the C-17 Globemaster III, A&T is responsible for aerial tanker aircraft and other U.S. Air Force and U.S. Navy airlift programs, including the Seattle-based C-32 and C-40 aircraft programs. A&T employs over 8,700 people at its headquarters in Long Beach, CA, and facilities in Macon, GA; Seattle, WA; and St. Louis, MO. A&T also has personnel assigned to customer support facilities at Air Force bases in South Carolina, Texas, and Oklahoma. Seven unions represent 55 percent of A&T's workforce.

In addition to other awards, A&T received the California Governor's Golden State Quality Award for management in 1996, and its Macon facility received the Georgia Governor's Employer of the Year Award in 1998.

#### **Quality Response**

A&T is in the midst of fulfilling the largest contract ever awarded by the U.S. government—a \$14.2 billion agreement to deliver 80 C-17s to the Air Force. Signed in 1996, the contract affirmed a major turnaround in the company's performance and its ability to make and deliver the world's most advanced airlifter on time and within budget. Since 1995, A&T has maintained an on-time delivery record of 100 percent. A few years earlier, the Defense Department had threatened to cancel the C-17 program. Technical problems,

cost overruns, and late deliveries vexed the complex concurrent development and production effort.

A&T's customer demanded immediate improvements. The organization, then a unit of the McDonnell Douglas Corp., responded with a complete overhaul of its business, aiming to become "process-focused and customer-driven." It initiated partnerships with customers, unions, and suppliers. It replaced manager-controlled teams with empowered teams that now function like small businesses motivated by common, systematically developed goals. A&T directly involved its 7,000 Air Force customers and suppliers in planning and decision making at all organizational levels.

In 1993, A&T began to work more closely with its customer to use Customer Performance Assessment Report (CPAR) ratings as valuable feedback to identify areas for improvement. The CPAR is the Air Force's primary tool for rating contractor performance. Since 1993, A&T has received "satisfactory" or "exceptional" ratings in all CPAR categories.

### **Interconnected Processes**

Interdependence and integration characterize A&T's organizational structure and its approaches to performance improvement. A high-level "enterprise process model" defines the entire business as eight interconnected process "families." These major groupings range from enterprise leadership and new business development to production and post-delivery product support. Each family encompasses up to 10 major processes, which, in turn, are made up of several tiers of supporting subprocesses.

The result is a coherent framework for process management. The model provides a direct line-of-sight from A&T-wide initiatives to the work plans and goals of teams and workers. It also helps to identify apparent operational dependencies that link subsets of process families. A&T manages these cross-cutting relationships as "mega-processes" that typically extend to suppliers and customers.

David Spong, A&T vice president and general manager, heads the Leadership Team that sets the organization's strategic direction using its 10-step Integrated Planning Process. A key responsibility is defining the requirements and expectations of A&T's customers, workers, suppliers, shareholders, and the local community. Beyond analyses of A&T's diverse collection of data, executives draw on

information gathered during their many direct contacts with these major stakeholders. Leadership Team members spend up to half their time communicating with Air Force customers. Interactions include daily phone calls and "stand-up" (to ensure brevity) meetings, videoconferencing meetings, weekly reviews, and formal program evaluations. Inside A&T, executives meet with employees in roundtable discussions, focus groups, and a variety of other venues. In addition, senior executives lead quality awareness sessions with A&T suppliers, who number more than 600 and account for two-thirds of the cost of the C-17.

These and other face-to-face interactions sharpen the Leadership Team's understanding of more than 30 formal assessments of factors ranging from customer requirements to market risks to the regulatory environment. Cross-comparisons also are performed during the integrated planning process. For example, results of customer, workforce, and supplier surveys are correlated to help the team uncover high-leverage opportunities for improvement.

The planning process yields short- and long-term objectives for increasing customer satisfaction, improving processes, and strengthening market position. A&T also identifies deficiencies, formulates strategies to close these performance gaps, and develops implementation plans. These outputs are organized into an annually updated 10-year operating plan.

#### **Process-Based Management**

To help it "perform to plan," A&T has developed a seven-step approach for defining, managing, stabilizing, and improving processes. This process-based management, or PBM, methodology also is used to set performance metrics that are indicators of efficiency and the chief drivers of customer satisfaction: quality, timeliness, and cycle time.

PBM is the principal tool of A&T's more than 100 Integrated Product Teams (IPTs) and the even larger number of functional and self-directed work teams that support the IPTs. Made up of engineering, work-team, customer, and supplier representatives, IPTs oversee the design, production, and delivery of the C-17's more than 125,000 parts and supporting services. Inclusion of work-team members ensures a systematic approach to process design and clear communication of the most important elements of the product to be manufactured or assembled. Customer

participation helps to maintain the focus on priority requirements for quality and performance.

Using the PBM approach, IPTs have become adept at zeroing in on process improvement opportunities. One team, for example, developed a dry sealant to pre-coat the 1.4 million fasteners used to assemble a C-17. The innovation stemmed from the IPT's desire to replace a "wet" sealant that was difficult to apply and cost more to dispose of than to buy. The innovation reduced rework, improved airframe quality, reduced structural fatigue, and enabled mechanics to work "faster, cleaner, and better."

IPTs manage their own resources and are responsible for meeting all quality, technical, schedule, and cost requirements. High performance work teams, which are part of the IPTs, go through four stages of training and development to foster shared commitment, impart technical skills, and teach team-based decisionmaking methods. As teams move from one stage to the next, their autonomy and responsibility increase. The facilitator measures team-based competencies and behaviors, task performance, and results—in short, the team's readiness to become full "owner" of a product, service, or process.

In partnership with its unions, A&T has created a seamless environment that enables union and non-union workers alike to participate and contribute. Production job classifications have been reduced to 10 and the number of duties in a category has been increased considerably. Two-thirds of factory employees are in the same classification, and 90 percent of engineers occupy a single job family.

### **Results**

A&T's share of the U.S. military airlift market is 84 percent, almost eight times larger than its nearest competitor. The company credits its team structure with a better than 60 percent improvement in productivity, measured as revenue generated per employee. Productivity has increased from \$200,000 per employee in 1994 to a projected \$327,000 in 1998. For three of the last four years, A&T's productivity levels have topped those of its best competitor.

Partnering with suppliers also has paid off. Rejection rates have dropped from 0.9 percent in 1994 to 0.08 percent during 1998, and supplier on-time delivery has jumped to 99.8 percent, up from 75.9 percent. With its PBM methodology, A&T

has improved the performance of its 50 major processes. From 1994 to 1998, performance on key quality measures has improved by 50 percent. Over the same span, A&T cut cycle time by more than 80 percent.

Since 1992, time spent on rework and repair of the C-17 has been reduced by 54 percent, a solid indicator of quality gains. Mean time between corrective maintenance has increased eightfold since 1993; the C-17's current level of performance is nearly four times better than that of the next best competitor's aircraft.

Trends in key measures of financial performance parallel gains in quality and operational performance. A&T's return on net assets was nearly seven times better than the next best competitor in 1997. Net asset turnover has improved by a factor of seven since 1994, while return on sales has improved nearly threefold.

Source:

"Malcolm Baldrige National Quality Award 1998 Winners." Online. National Institute of Standards and Technology hp. Available. <http://www.quality.nist.gov/docs/winners/98win/98wing.htm>. 21 May 1999.



## APPENDIX C

E-2C FISCAL YEAR 98 PERFORMANCE BASED PAYMENT SCHEDULE  
(AMOUNTS IN \$000s)

<u>MONTH</u>	<u>A-175 Event</u>	<u>A-176 Event</u>	<u>A-177 Event</u>	<u>Payment</u>	<u>Liquidation</u>
Aug-97				464	
Sep-97				5,326	
Oct-97				7,778	
Nov-97				7,729	
Dec-97				7,683	
Jan-98				8,123	
Feb-98				7,046	
Mar-98				6,108	
Apr-98				6,028	
May-98				5,935	
Jun-98				6,584	
Jul-98	Keels			8,051	
Aug-98				3,640	
Sep-98				6,164	
Oct-98	Quads	Keels		5,369	
Nov-98	Lwr Fwd Structure			5,551	
Dec-98		Quads		5,040	
Jan-99			Keels	4,413	
Feb-99	Fwd Section	Lwr Fwd Structure		4,214	
Mar-99			Quads	4,311	
Apr-99		Fwd Section	Lwr Fwd Structure	3,760	
May-99	Pre-Join			3,618	
Jun-99	CIC Cabinet		Fwd Section	2,930	
Jul-99		CIC Cabinet		2,754	
Aug-99	WCS Laydown			2,695	
Sep-99	Rotodome Buildup	Tail Section	Pre-Join	2,871	
Oct-99	Pylon		CIC Cabinet	2,387	
Nov-99		Rotodome Buildup		2,340	
Dec-99	Final Paint	Pylon		2,300	
Jan-00	1st Airframe Flt	DTMCO	WCS Laydown	2,127	
Feb-00	Final Prod. Test Flt			1,885	10,574
Mar-00		Final Paint	Rotodome Buildup	1,783	
Apr-00		1st Airframe Flt	Pylon	1,677	
May-00		System Sells	DTMCO	1,489	
Jun-00		Final Prod. Test Flt	Final Paint	1,407	10,574
Jul-00			1st Airframe Flt	1,049	
Aug-00			System Sells	872	
Sep-00			Final Prod. Test Flt	786	10,574

<u>MONTH</u>	<u>A-175 Event</u>	<u>A-176 Event</u>	<u>A-177 Event</u>	<u>Payment</u>	<u>Liquidation</u>
Oct-00			Del Prep	638	
			Total	154,927	31,722
			Total		186,649

Source: FY98 E-2C contract modification to PBP

## APPENDIX D

E-2C FISCAL YEAR 98 PRICE, PAYMENT, AND COST SCHEDULE  
(AMOUNTS IN \$000s)

Month	PBP	Schedule Payments	Liquidation Rate	*Actual Payments	Progress Payments	Price	Actual Costs
	Schedule Payments						
Aug-97	464					559	499
Sep-97	5,326			5,789	374	6,416	5,729
Oct-97	7,778			6,028	4,297	9,371	8,367
Nov-97	7,729			15,506	6,275	9,311	8,314
Dec-97	7,683				6,235	9,257	8,265
Jan-98	8,123				6,199	9,787	8,739
Feb-98	7,046				6,554	8,489	7,579
Mar-98	6,108			29,397	5,685	7,359	6,571
Apr-98	6,028			6,108	4,928	7,263	6,485
May-98	5,935			5,935	4,864	7,150	6,384
Jun-98	6,584				4,788	7,933	7,083
Jul-98	8,051				5,312	9,700	8,661
Aug-98	3,640			6,051	6,496	4,386	3,916
Sep-98	6,164			12,004	2,937	7,427	6,631
Oct-98	5,369			2,685	4,973	6,469	5,776
Nov-98	5,551				4,332	6,688	5,971
Dec-98	5,040			7,097	4,478	6,072	5,421
Jan-99	4,413				4,066	5,316	4,747
Feb-99	4,214				3,560	5,077	4,533
Mar-99	4,311			5,040	3,400	5,194	4,638
Apr-99	3,760				3,478	4,530	4,044
May-99	3,618					4,359	3,892
Jun-99	2,930					3,530	3,152
Jul-99	2,754					3,318	2,963
Aug-99	2,695					3,247	2,899
Sep-99	2,871					3,460	3,089
Oct-99	2,387					2,876	2,568
Nov-99	2,340					2,819	2,517
Dec-99	2,300					2,771	2,474
Jan-00	2,127					2,563	2,289
Feb-00	1,885	10,574				2,271	2,028
Mar-00	1,783					2,149	1,918
Apr-00	1,677					2,021	1,804
May-00	1,489					1,795	1,602
Jun-00	1,407	10,574				1,696	1,514
Jul-00	1,049					1,264	1,129

Month	PBP Schedule Payments	Liquidation Rate	*Actual Payments	Progress Payments	Price	Actual Costs
Aug-00	872				1,051	938
Sep-00	786	10,574			946	845
Oct-00	638				768	686

Methodology:

1. Profit rate 12%
2. PBP Rate 83%
3. Prog. Pymt Rate 75%

Other:

♦From MOCAS data provided by DCMC (Guinasso FW: PBPs).

★Progress payments were delayed one month since large business vendor costs are not eligible for progress payments until they are paid vs. incurred for small businesses. That adds about a thirty-day additional lag into the cash flow for material for a large business (Guinasso Re: MOCAS).

## APPENDIX E

### List of Telephone Interviewees

1. Baker, Cathy, FMTV ACO, DCMC, Sealy, TX, 14 May 1999.
2. Bemben, Bob, Member of Cost, Price and Finance Directorate, OUSD(A&T)DP, Washington, DC, 14 May 1999.
3. Biga, James, Contract Specialist, TACOM, Warren, MI, 18 May 1999.
4. Fleming, Ruth, GS-13 DCMC Liaison, DFAS, Cleveland, OH, 12 May 1999.
5. Guinasso, David, DCMCC-J, DCMC, Ft. Belvoir, VA, 21 May 1999.
6. Heimrel, Jim, Price Analyst, DCMC, Minneapolis, MN, 21 May 1999.
7. Hopkins, Zelma, Assistant to Chief Entitlements, DFAS, Columbus, OH, 16 Apr. 1999.
8. Loomis, Chad, Manager of Contracts, Stewart & Stevenson Tactical Vehicle Systems, Sealy, TX, 27 May 1999.
9. Mark, Jeffery, Manager of Contracts and Pricing for the E-2C Program, Northrop Grumman Corp., Bethpage, NY, 21 Apr. 1999.
10. Morrison, Dan, Specialist in Contract Pricing for the C-17 Program, Boeing-McDonnell Douglas, Long Beach, CA, 3 May 1999.
11. Nowiki, Tim, C-17 Production ACO, DCMC, Long Beach, CA, 12 May 1999.
12. O'Connell, Terrence, E-2C PCO, NAVAIR, Patuxent River, MD, 7 May 1999.
13. Ronda, Brad, E-2C ACO, DCMC, Bethpage, NY, 9 Apr. 1999.
14. Vangness, Kevin, C-17 PCO, AFMC, Wright Patterson AFB, OH, 7 May 1999



## LIST OF REFERENCES

- Bemben, Bob. Telephone conversation. 12 Mar. 1999.
- Biga, James. "Re: PBP QUESTIONS." E-mail to the author. 11 May 1999.
- "Advanced Issues in Contract Pricing." Contract Pricing Reference Guide. Vol.4, Jul. 1997. CD-ROM. Defense Acquisition Deskbook. Dec. 1998.
- "Contract Financing." Federal Acquisition Circular. Item I, Number 90-33 (FAR Case 94-764). 26 Sep. 1995.
- Defense Acquisition Course CON 201. Government Contract Law, Students Deskbook. Oct. 1996. CD-ROM. Defense Acquisition Deskbook. Dec. 1998.
- Dept. of Defense. Defense Federal Acquisition Regulation. Part 232; Contract Financing. Washington: GPO, 7 May 1999. Online. Defense Acquisition Deskbook Web Edition. May 1999. Available. <http://web.desbook.osd.mil/default.asp?tasklist.asp>. 5 Jun. 1999.
- Dept. of Defense. Defense Financial and Investment Review. Washington: GPO, June 1985.
- Dept. of Defense, Office of the Inspector General. Financial Statement Presentations of DoD Progress Payments. Audit Report No. 98-139, Washington: GPO, 27 May 1998.
- Dodson, Paul. "AM General vies for Army pact." South Bend Tribune. 4 Nov. 1998. Online. South Bend Tribune online. Available. <http://www.sbtinfo.com/98/nov/110498/business/124792.htm>. 18 Mar. 1999.
- "E-2C Aircraft." Online. Navy hp. Available. <http://www.navy.mil/homepages/seahawks/acft.html>. 10 Mar. 1999.
- "E-2C Hawkeye." Online. Northrop Grumman hp. Available. [http://www.northgrum.com/Corp\\_web/products\\_pages/e2c.hawkeye.html](http://www.northgrum.com/Corp_web/products_pages/e2c.hawkeye.html). 29 Mar. 1999.
- "E-2C Hawkeye Early Warning Aircraft." Online. Northrop Grumman Field Support Services hp. Available. <http://www.ngc-sandiego.com/e2c.html>. 10 Mar. 1999.
- Elgart, Edward G. Personal interview. 14 Jan. 1999.

Federal Acquisition Regulation. CD-ROM. Defense Acquisition Deskbook. Dec. 1998.

"Federal Acquisition Regulation: Progress Payments and Related Financing Policies; Proposed Rule." Federal Register. Vol. 64, No. 27, 10 Feb. 1999. Available. GPO Access. 13 Feb. 1999.

"FMTV FY00/01 OPA1 Budget Material." Online. Assistant Secretary of the Army (Financial Management & Comptroller). Available: <http://134.11.192.15/budget/0001pb/armybudget0001.htm>. 24 Apr. 1999.

"FY 1999 Budget Material." Procurement Programs (P-1). Online. Office of the Under Secretary of Defense (Comptroller) hp. Available. <http://www.dtic.mil/comptroller/99budget/>. 17 Mar. 1999.

"FY 2000 Highlights Book." Section III - Recapitalization (Aviation Programs). Online. Department of the Navy, Office of Budget hp. Available. [http://NAVWEB.SECNAV.NAVY.MIL/pubbud/00pres/highbook/00highbk\\_u.html](http://NAVWEB.SECNAV.NAVY.MIL/pubbud/00pres/highbook/00highbk_u.html). 17 Mar. 1999.

Guinasso, David K. "Performance Based Payments." AQOC PowerPoint presentation. Online. Defense Contract Management Comand. Available: <http://www.dcmc.hq.dla.mil/Teaminfo/AQOC/Pbp.pdf>. 28 Jan. 1999.

Guinasso, David K. "FW: PBPs." E-mail to the author. 7 May 1999.

Guinasso, David K. "RE: MOCAS DATA FOR FY98 E-2C PRODUCTION CONTRACT." E-mail to the author. 19 May 1999.

Guinasso, David K. Telephone interview. 23 Jan. 1999.

Guinasso, David K. Telephone interview. 7 May 1999.

Guinasso, David K. Telephone interview. 21 May 1999.

Loomis, Chad. Telephone interview. 27 May 1999.

Muskopf, Janice. "Performance-Based Payments (PBP) 101." ASC/PKFH presentation.

- "Negotiating Performance Based Payment Terms and Conditions." Online. Defense Contract Management Command. Available: <http://www.dcma.mil/Teaminfo/AQOC/Pbptstc.PDF>. 28 Jan. 1999.
- "Northrop Grumman Awarded E-2C Multiyear Contract." Online. Northrop Grumman hp. Available: [http://www.northgrum.com/Corp\\_web/news\\_pages/1999.apr.html](http://www.northgrum.com/Corp_web/news_pages/1999.apr.html). 28 Apr. 1999.
- O'Connell, Terrence. Personal interview. 22 Mar. 1999.
- O'Connell, Terrence. Personal interview. 7 May 1999.
- Owens, Gregory W. "Alpha Acquisition." 19 Mar. 1998. Online. Defense Acquisition Deskbook Web Edition. Apr. 1999. Available. <http://web.deskbook.osd.mil/default.asp?tasklist.asp>. 15 May 1999.
- "Performance Based Payments." Chapter 4.5.3 Defense Logistics Agency Directive 5000.4. Online. Defense Contract Management Command. Available: <http://www.dcmc.hq.dla.mil/onebook/4.0.0/4.5.0/4.5.3/4-5.3f.htm>. 8 Jan. 1999.
- "Public Law 103-355: Federal Streamlining Acquisition Act of 1994." S.1587. 13 Oct. 1994. Online. Thomas hp. Available: <http://rs9.loc.gov/home/thomas.html>. 21 Feb. 1999.
- Spector, Eleanor R. "Performance-Based Payments." Director of Defense Procurement, Under Secretary of Defense, Acquisition and Technology Memorandum. 9 Nov. 1998.
- "Stewart and Stevenson Receives Second Award for U.S. Army Family of Medium Tactical Vehicles (FMTV) Trucks." Online. Stewart and Stevenson hp. Available: <http://www.sss.com/home/pressreleases/press98.html>. 5 Feb. 1999.
- Stoughton, William R. "FASA's Contract Financing Provisions: More Glitter Than Gold?" Federal Contract Report. 3 Feb. 1997: 124-133.
- U.S. General Accounting Office. Army Medium Trucks: Acquisition Plans Need Safeguards. GAO/NSIAD-99-28, Washington: GPO, 19 Nov. 1998.

U.S. General Accounting Office. Army Medium Trucks: Information Delivery Delays and Corrosion Problems. GAO/NSIAD-99-26, Washington: GPO, 13 Jan. 1999.

U.S. General Accounting Office. C-17 Aircraft: Cost and Performance Issues. GAO/NSIAD-95-26, Washington: GPO, 26 Jan. 1995.

U.S. General Accounting Office. Military Airlift: Options Exist for Meeting Requirements While Acquiring Fewer C-17s. GAO/NSIAD-97-38, Washington: GPO, 19 Feb. 1997.

Vangsness, Kevin. Telephone interview. 7 May 1999.

Vangsness, Kevin. "RE: PBP Attachment." E-mail to the author. 9 Apr. 1999.

Wall, Richard J., and Gustin, Robert A. "FASA Contract Financing Reforms (An Offer You Can't Refuse?)." CP&A Report. Oct. 1995: 3-16.

## INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center..... 2  
8725 John J. Kingman Road, Ste 0944  
Fort Belvoir, VA 22060-6218
2. Dudley Knox Library..... 2  
Naval Postgraduate School  
411 Dyer Road  
Monterey, CA 93943-5101
3. Defense Logistics Studies Information Exchange..... 1  
U.S. Army Logistics Management College  
Fort Lee, VA 23801-5101
4. CDR David A. Smith, SC, USN, Code SM/Sv..... 1  
Naval Postgraduate School  
Department of Systems Management  
Monterey, CA 93943-5002
5. Joseph G. San Miguel, Code SM/sm..... 1  
Naval Postgraduate School  
Department of Systems Management  
Monterey, CA 93943-5002
6. LCDR John M. Pearson..... 1  
13514 Kingsride Lane.  
Houston, TX 77079
7. David V. Lamm, Code SM/Lt..... 3  
Naval Postgraduate School  
Monterey, CA 93943-5002
8. Dan Morrison ..... 1  
Boeing Company (Attn: C073-0410)  
2401 East Wardlow Road  
Long Beach, CA 90817-4418
9. DCMC Stewart & Stevenson – Sealy..... 1  
Attn: Cathy Baker  
P.O. Box 457  
Sealy, TX 77474-0457

10. CDR Jeffrey R. Cuskey, SC, USN, Code SM/ck ..... 1  
Naval Postgraduate School  
Department of Systems Management  
Monterey, CA 93943-5002